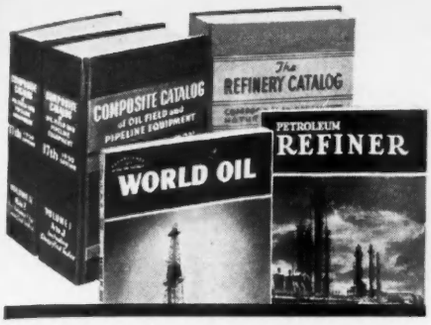


Specialized Oil Publications of
THE GULF PUBLISHING COMPANY
3301 Buffalo Drive, Houston 6, Texas
Box 2608, Houston (1), Texas
WORLD OIL and The COMPOSITE CATALOG
for the drilling-producing-pipe line industry
PETROLEUM REFINER and The REFINERY CATALOG
for the refining-natural gasoline industry

RAY L. DUDLEY, *President, Publisher*
A. L. BURNS, *General Manager*
WARREN L. BAKER, *Editorial Director*

EDITORIAL STAFF

WARREN L. BAKER, *Editor*
AL REESE, *Managing Editor*
L. J. LOGAN, *Associate Editor*
CECIL W. SMITH, *Statistical Editor*
J. E. KASTROP, *Production Editor*
W. B. COLVIN, *Drilling Editor*
DONALD M. TAYLOR, *Pipe Line Editor*
DON KLIEWER, *International Editor*

DISTRICT EDITORS

ROBERT E. SPANN, 250 Park Ave., New York 17, N. Y.
GILBERT M. WILSON, W. W. Wilson Bldg., Huntington Park, Calif.
ANTHONY GIBBON, Hunt Bldg., Tulsa 3, Okla.
MARION DENNARD RUTH THOMPSON
Editorial Assistants
MARY A. ZUBER, *Librarian*

ADVERTISING STAFF

TOM W. NELSON, *Advertising Manager*
ROGER MOTHERAL, *Eastern Advertising Manager*
250 Park Ave., New York 17, N. Y.
NELSON BIGELOW, 250 Park Ave., New York 17, N. Y.
BILL WESTFALL, 1010 Euclid Ave., Cleveland 15, Ohio
H. G. FITZPATRICK MARTIN HALLORAN
332 S. Michigan Ave., Chicago 14, Ill.
BILL ATCHESON, Hunt Bldg., Tulsa 3, Okla.
J. W. CURTS, W. W. Wilson Bldg., Huntington Park, Calif.
CHARLES WYATT DOUG CRAIG
3301 Buffalo Drive, Houston 6, Texas

CIRCULATION DEPARTMENT

R. M. DE SOMBRE, *Manager*

Single copies 50 cents (except special issues). Subscription price: domestic and foreign, $2 a year; 2 years, $3; 3 years, $4. WORLD OIL published every month except semi-monthly in February and July. Entered as *The Oil Weekly* as second class mail matter December 23, 1916, at the post office at Houston, Texas, under the act of March 3, 1879. Advertising rates on application. Copyright, 1951, by The Gulf Publishing Company.

Indexed by Industrial Arts Index and Engineering Index

Out of ideas for Christmas gifts?

Why not arrange some WORLD OIL subscriptions for your friends? It's practical, yet reasonable. Mail us a list of names today. An appropriate card will be sent to announce your gift.

ABC

WORLD OIL

HBP

Established 1916 as THE OIL WEEKLY ®

CONTENTS

December, 1951 **Vol. 133, No. 7**

CURRENT OUTLOOK SECTION

Looking Ahead ... 35
Editor's Page ... *Warren L. Baker* 37
The Changing Panorama ... 39
Report from the Observatory ... *Ray L. Dudley and Warren L. Baker* 40
Petroleum Trends ... *Cecil W. Smith* 42
Monthly News Analysis ... 45
The Month's Completions ... 50
Canadian Exports No 'If' . . . but 'How Soon' ... 55
PAD Forecasts 4.4 Percent Demand Hike in 1952 ... 57
'Last Drop' of Oil Sighted ... *Robert E. Spann* 61
Conserve Manpower and Materials ... *H. H. Anderson* 62

NEW EQUIPMENT SECTION

For More Information on Products Advertised ... 70
Reader Service Postcards ... Opp. 70-71
New Catalogs and Equipment Literature ... Opp. 70-71
New and Improved Equipment Supplementing Composite Catalog ... 71
Other New and Improved Equipment ... 73
New Catalogs and Equipment Literature in Advertisements ... 78

EXPLORATION SECTION

Geophysical Operations in the Canadian Bush ... *J. K. MacMillan* 81
Western Anadarko Basin Geophysical Problems ... *Neal Clayton* 86
South Ceres—Oklahoma's Oddest Shoestring Field ... *E. P. Neal* 92
Exploration 22.4 Percent Ahead of 1950 Period ... 100
U. S. Oil, Distillate and Gas Discoveries and Extensions in October ... 102

DRILLING SECTION

Canada's Subzero Temperatures Create Complex Problems ... *D. J. Elliott* 115
World Oil Graphics: Sub Care ... 120
Contractor's Cost Clinic: Automatic Recorder Improves Drilling Efficiency ... *W. B. Colvin* 121
Wilshire Conducts Second Spraberry Air Drilling Venture ... *O. H. Berry, Jr., and Wm. Queensbury, Jr.* 126
Appraisal of Drilling Mud Costs (First of Two Parts) ... *Victor V. Horner* 127
The Shielded Electrode Method ... *Hubert Quyod* 134
Drilling Engines Cooled With Own Waste Heat ... *Fred M. Burt* 146
Strata Variants Create Reactions in Plugged Wells ... *F. R. Cozzens* 151
How to Do It—Drilling Hints ... 156

PRODUCTION SECTION

Winter Operations in Western Canada ... *G. D. Wright* 169
Gas Well Casing Leak Detector ... *Joseph C. Richardson, Jr.* 176
New Techniques for Application of Plastics in Consolidating Formations ... *H. B. Ritch and P. H. Cardwell* 177
Water Injection in Primary Production Pays Off ... *W. H. Davis* 187
Variation of Oil Characteristics With Elevation in Oil Reservoirs ... *Cecil Q. Cupps, Philip H. Lipstate, Jr., and Joseph Fry* 192
Heating Power Oil in Hydraulic Pumping ... 200
Oil Men at Midland Debate: Spraberry a Siltstone? ... 206
How to Do It—Production Hints ... 212

PIPE LINE SECTION

Canadian Pipe Line Expansion ... *Bob Shiels and Cecil W. Smith* 223
Selection and Operation of Water-Cooling Towers and Air-Cooled Heat Exchangers ... *Howard E. Degler* 228
Centrifugal Pump Increases Crude Throughput ... *Tom L. Turner* 238
Pipe Line Construction ... 239
How to Do It—Pipe Line Hints ... 241

• SPECIAL INTERNATIONAL SECTION •

1951 in Canada ... *Gilbert M. Wilson* 249
IMPORTANT CANADIAN FIELDS
Wizard Lake Field Is Four-Zone Strike ... 262
New Norway Field Is Recent Dual Pay Reef Discovery ... 264
Caprona Field Has High Potential in D-2 Reef ... 266
Bashaw Field Discovery Demonstrates High D-3 Reef Potentials ... 268
Armena Field Is Promising New Viking Sand Discovery ... 272
Canada's Reef Fairway Due for Big Year in '52 ... *L. F. Frantz* 278
Redwater Review ... *R. D. Knowles* 283
Kingdoms of Oil: Edmonton, Canada ... *Bob Shiels* 289
Canadian Oil Search Pushes North ... 295
Of World Oil Men ... 310

DEPARTMENTS

The Oil Man's Calendar ... 32
Men in the Industry News ... 314
Equipment and Service Suppliers' Notes ... 328
Squeaks from the Bullwheel ... 340

ADVERTISERS' INDEX

*Asterisk preceding name of advertiser indicates that detailed data on products and services of the firm will be found in current 18th (1951) edition of The Composite Catalog of Oil Field and Pipe Line Equipment.

A

A & G Distributors....340
Acme Foundry & Machine Co....242
Aero Service Corp....285
Affiliated National Hotels....238
*The Aldrich Pump Co....204
The Ford Alexander Corp....161
*Allis-Chalmers Manufacturing Co....287
*Altens Foundry & Machine Works, Inc....308
*American Iron & Machine Works Co....125 and IV Cover
*American Manufacturing Company of Texas....6
*American Sand-Banum Co....162
Associated Oil Field Rentals....316
*Axelson Manufacturing Co....171

B

*B & W Incorporated....298
*Baash-Ross Tool Co....69
The Baker Manufacturing Co....311
*Baker Oil Tools, Inc....38 and 260-261
Bank of Montreal....280
The Bank of Nova Scotia....282
*Baroid Sales Division National Lead Co....248 and III Cover
Wm. M. Barret, Inc....340
The J. B. Beaird Co....227
Beaumont Well Works Co....321
*Beaver Pipe Tools, Inc....245
Bell Rubber Co....210
*Bethlehem Steel Co....10, 47 and 159
*Bettis Corp....309
*Black, Sivalls & Bryson, Inc....180-181 and 191
The Bovaird Supply Co....168
*S. R. Bowen Co....317
*The Brewster Co....91
*Bucyrus-Erie Co....25
*Byron Jackson Co....99 and 309

C

Cable & Staples....210
*Cameron Iron Works, Inc....114
Canadian Allis-Chalmers Limited 245, 305 and 313
The Canadian Bank of Commerce....293
*Cardwell Manufacturing Co....58-59
*Catawissa Valve & Fittings Co....335
Caterpillar Tractor Co....11
*The Cavins Co....305
*Century Geophysical Corp....95
Chicago & Southern Air Lines....327
*Chiksan Co....324
*Christensen Diamond Products Co....160
*Clark Bros. Co....236-237
Columbus McKinnon Chain Corp....152
Continental Oil Co....14
The Continental Supply Co....131-132
*Fred E. Cooper, Inc....275
*The Cooper-Bessemer Corp....299
Core Laboratories, Inc....107
*Crane Co....41

D

*Detroit Diesel Engine Division General Motors Corp....101
*The Dia-Log Co....161
Dowell Incorporated....36
Dresser Industries, Inc....145, 197, 236-237 and 331
*Drilling & Service, Inc....153
E. I. du Pont de Nemours & Co....128 and 198-199

E

The Eagle-Picher Co....334
*Eastman Oil Well Survey Co....141
E. H. Edwards Co....165
Eisenwerk Wuelfel....175
Empire Trust Co....106
*Emsco Derrick & Equipment Co....131-132

F

*Fairbanks, Morse & Co....209
The First National Bank & Trust Co....333
First National Bank in Dallas....319
*Fluid Packed Pump Co....185-186
*Fuller Co....193

G

*Gaso Pump & Burner Mfg. Co....221
General Geophysical Co....79
*General Motors Corp....101
The Geolograph Co....313
Geophysical Service, Inc....85
*Goodall Rubber Co....163
The B. F. Goodrich Co....9
*The Goodyear Tire & Rubber Co....5
*H. P. Gott Manufacturing Co....340
*Grant Oil Tool Co....336
*The Guiberson Corp....109
Gulf Oil Corp....22

H

*Halliburton Oil Well Cementing Co....44, 80 and 157
*Harbison-Fischer Mfg. Co....217 and 219
*Harrisburg Steel Corp....244
*Herb J. Hawthorne, Inc....87
Hector Machine Co....344
*Hercules Tool Co....206
Hetz Auction Sales....313
Hinderliter Tool Company Division H. K. Porter Co....343
*Homelite Corp....67
Houston Laboratories....344
*Houston Ready-Cut House Co....220
*J. M. Huber Corp....338
*Hughes Tool Co....I Cover and 247
*Hutchison Manufacturing Co....164

I

Imperial Bank of Canada....310
Independent Exploration Co....93
Infilco Incorporated....201
*International Harvester Co....4 and 259
The International Nickel Co....29

J

*Jefferson Union Co....218
*Jensen Brothers Manufacturing Co....214
*M. O. Johnston Oil Field Service Corp....135
*Johnston Oil Field Service Corp....15
*The S. M. Jones Co....207
Jones & Laughlin Supply Co....17
*Joy Manufacturing Co....89
*Justrite Manufacturing Co....321

K

Kaiser Steel Corp....243
Kelley Manufacturing Co....330
Kern Directional Drilling Corp....154
*Kerotest Manufacturing Co....315
Kimray, Inc....318
*King Oil Tools....112
*Kinzbach Tool Co....332
*Kobe, Inc....197

L

*L & H Machine Works....154 and 330
*Lane-Wells Company....33, 65, 179, 255 and 342
*The Layne & Bowler Co....12
*LeBus International Engineers, Ltd....276-277
Levingston Shipbuilding Co....325
Leyman Manufacturing Corp....326
*Link-Belt Co....3
Lone Star Cement Corp....II Cover
*Lone Star Tool Co....158
*Lucey Export Corp....257
*Lufkin Foundry & Machine Co....303

M

Mack Trucks, Inc....307
*Magnet Cove Barium Corp....145
*Maloney-Crawford Tank & Mfg. Co....21
*Jas. P. Marsh Corp....77
*Martin-Decker Corp....322
*McCullough Tool Co....341
McGowan Pump Co....326
*McKissick Products Corp....18
*Mid-Continent Supply Co....235 and 342
*Miller Sand Pump Co....218
*Mission Manufacturing Co....149
*Lee C. Moore Corp....139
*Morse Chain Co....297

N

*National Lead Co....248 and III Cover
*The National Supply Co....51-52-53-54
*National Tank Co....173
National Tube Co....155 and 294
Nelson Co....340
*Nordstrom Valve Division Rockwell Manufacturing Co....27
*W. C. Norris, Manufacturers, Inc....49

O

*Oil Center Tool Co....211
*Oil Well Manufacturing Corp....102
*Oil Well Supply Co....8
*Orbit Valve Co....273
*Otis Pressure Control, Inc....213

P

Pacific Coast Borax Co....302
*Pacific Pumps, Inc....331
*Page Oil Tools, Inc....208
*Parelex Corp....210
*Parkersburg Machine Co....344
*The Parkersburg Rig & Reel Co....28
*Pelican Well Tool & Supply Co....325
*Perforating Guns of Canada, Ltd....288
Petroleum Distributing Co....314
Petroleum Electric Power Association....233
*Petroleum Specialty Co....215
Piper Aircraft Corp....63
Pittsburgh Coke & Chemical Co....320
H. K. Porter Co....343
H. C. Price Co....245

R

*Rector Well Equipment Co....195
*Rectorseal....210
*Reda Pump Co....220
*Reed Roller Bit Co....113 and 143
Republic Exploration Co....104
*Republic Steel Corp....19 and 225
*The Ridge Tool Co....323
*Rockwell Manufacturing Co....13 and 27
*John A. Roebling's Sons Co....31
The Royal Bank of Canada....306

S

*S & R Tool & Supply Co....305
Santa Fe Railway....337
*Schlumberger Well Surveying Corp....203
The Second National Bank of Houston....16
Seismograph Service Corp....34
*Shaffer Tool Works....24
A. O. Smith Corp....271
Southern Engine & Pump Co....321
*Southern Mill & Manufacturing Co....312
*Spang & Co....110
Standard Oil Company of California....20
*Standco Brake Lining Co....317 and 344
*Stitt Ignition Co....166

T

*Templeton, Kenly & Co....166
Texas Employers Insurance Association....30
*Texas Flange Co....108
*The Thermoid Co....23
*Thornhill-Craver Co....183
The Torrington Co....147
Trading Post....339
Trans-Texas Airways....344
*Tretolite Co....167
The Tripplehorn Co....216
Troian Construction Co....242
*Twin Disc Clutch Co....329

U

*Union Wire Rope Corp....96-97
United States Steel Corp....8, 155 and 294
United States Steel Export Co....155, 294 and 301

V

Varner Co....304
*Victaulic Company of America....32
*Visco Products Co....7

W

*W-K-M Company....189
*Waukesha Motor Co....75
Waukesha Sales & Service Co....137
*Web Wilson Oil Tools....269
Welex Jet Services, Inc....123
Well Surveys, Inc....105
Western Geophysical Co....103
Westinghouse Air Brake Co....317
*Wheeling Machine Products Co....240
*Whitney Chain Co....26
Wichita Tool Repair Co....166
*Wickwire Spencer Steel Division The Colorado Fuel & Iron Corp....150
Williams Brothers....246
*Wilson Manufacturing Co....118-119
*Wilson Supply Co....111 and 291
Wood, Gundy & Co....309

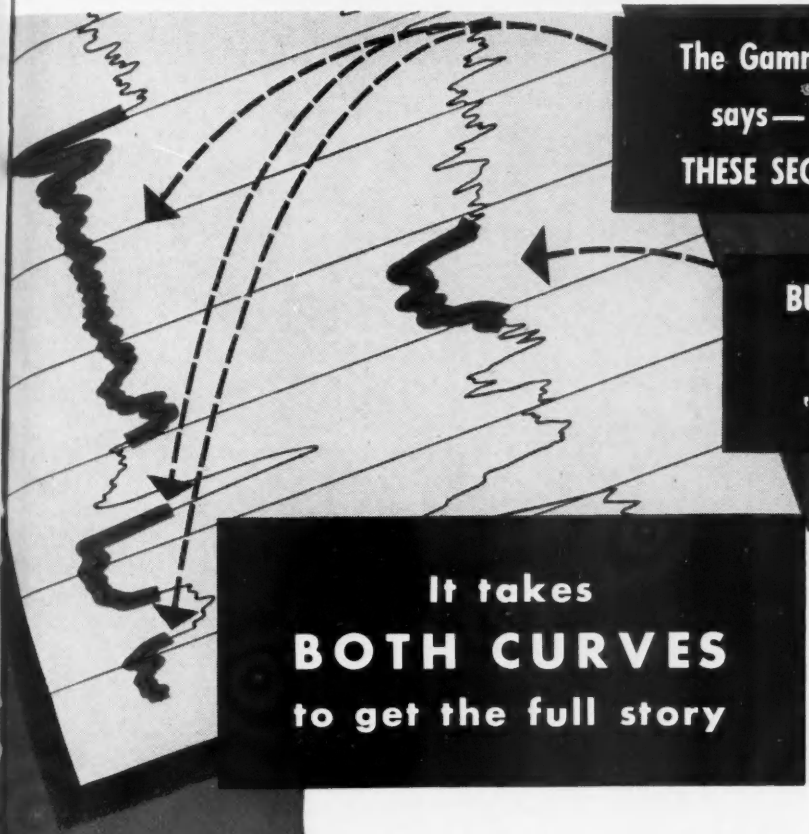
Y

The Youngstown Sheet & Tube Co....222

Current Outlook Section

L. J. LOGAN, SECTION EDITOR

WORLD OIL



How much difference can the complete down-hole story make to you? Well, take the example shown here. Figure for yourself the difference in money, time and labor between probing for production in a 300-foot *possible* zone, and testing a 100-foot section which is known to contain fluid.

That's one instance of what the Neutron Curve can do for you, because the Neutron Curve registers fluid content in the formations which the Gamma Ray has located and defined. Having the full story told by both curves, you waste no effort exploring dry formations or impermeable sections of productive zones. Knowing where there is fluid and where not, you can plan the most efficient and most economical completion for your well. (Incidentally, the well whose log was used as the illustration above was completed from the Neutron Curve as a very satisfactory producer.)

The Neutron Curve has other uses, such as showing fluid levels, casing seats and liner overlaps. But, for the best information on what *both* curves can do for you, ***Ask Your Lane-Wells Man About***

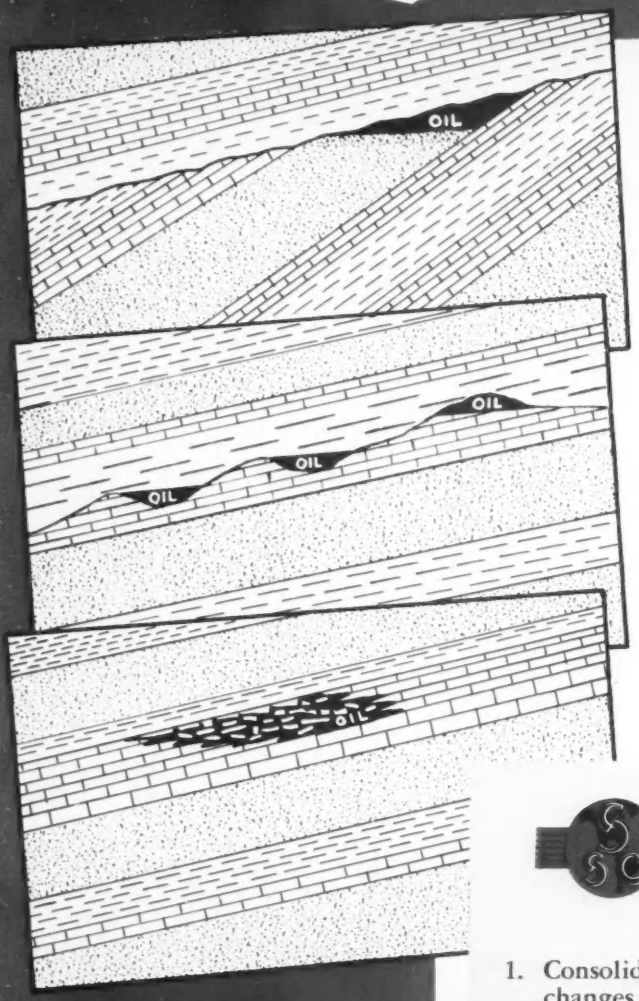
LANE WELLS
Radioactivity
WELL LOGGING

Tomorrow's Tools Today!

Los Angeles • Houston • Oklahoma City • Lane-Wells Canadian Co. in Canada • Petro-Tech Service Co. in Venezuela
Branch Offices, Export Office and Plant: 5610 So. Soto St., Los Angeles 58, California

Looking For STRAT-TRAPS?

HERE ARE 3 WELL-KNOWN STRATIGRAPHIC ACCUMULATIONS



TRUNCATION

Oil or gas accumulation may occur where sand bodies are tilted, truncated and overlain by impervious sediments.
Example — EAST TEXAS FIELD

BURIED RIDGES or ANCIENT TOPOGRAPHIC HIGHS

Stratigraphic accumulations are often found in depressions on such features, or in weathered erosional highs.
Example — BARTON ARCH, KANSAS

SOLUTION CAVITIES, or POROSITY DUE TO DOLOMITIZATION

Accumulations of this type are primarily stratigraphic.
Example — LIMA-INDIANA FIELD, OHIO and INDIANA

. . Recommends the Following General Approach to the Search for Stratigraphic Traps.

1. Consolidate all geologic information with particular reference to changes in lithology in the prospect area.
2. Obtain all available velocity information.
3. Make detailed velocity tests in all prospect wells, placing special emphasis on the determination of *interval velocities.*
4. Make full use of the opportunities presented by the continuous profiling method to assemble mass seismograph data, placing special emphasis on interval times—(TRACE ANALYSIS).
5. Separate time differentials caused by structural deformation or tilting, from differentials attributable to changes in lithology—(MAKE RESIDUAL MAPS).
6. Extrapolate from geologic control using imaginative geophysics.

☑ AD No. 1
1. TRUNCATION
2. BURIED RIDGES
3. SOLUTION CAVITIES

☐ AD No. 2
4. OVERLAP
5. ORGANIC REEF
6. FACIES CHANGE

A series of two advertisements showing 6 well-known stratigraphic accumulations.

Seismograph Service Corporation

TULSA, OKLAHOMA, U. S. A.

Looking Ahead

GROWTH OF CANADA'S oil industry is in danger of being retarded by overtaxation. This warning was issued before Canadian Club of Montreal by John C. Case, vice president and director in charge of producing for Socony-Vacuum Oil Company. Case opposed view that nations should obtain large direct benefits from oil production. Real benefit to the nation, said he, should come mainly through activity caused by oil itself.

U. S. CRUDE PRODUCTION in 1952 will remain uncomfortably close to maximum producing ability of nation. This in spite of fact only a relatively small production hike (150,000 barrels daily) is anticipated. While this situation would normally result in expanded drilling, a more critical steel shortage than experienced thus far may forbid sizable boost in drilling.

OIL COUNTRY TUBULAR GOODS allocation and distribution will get a thorough going-over shortly after the first of the year by the House Small Business Committee. Producers' opinions will be sought on PAD's distribution methods and on fairness of DPA's allocation of steel for tubular goods to PAD will be studied.

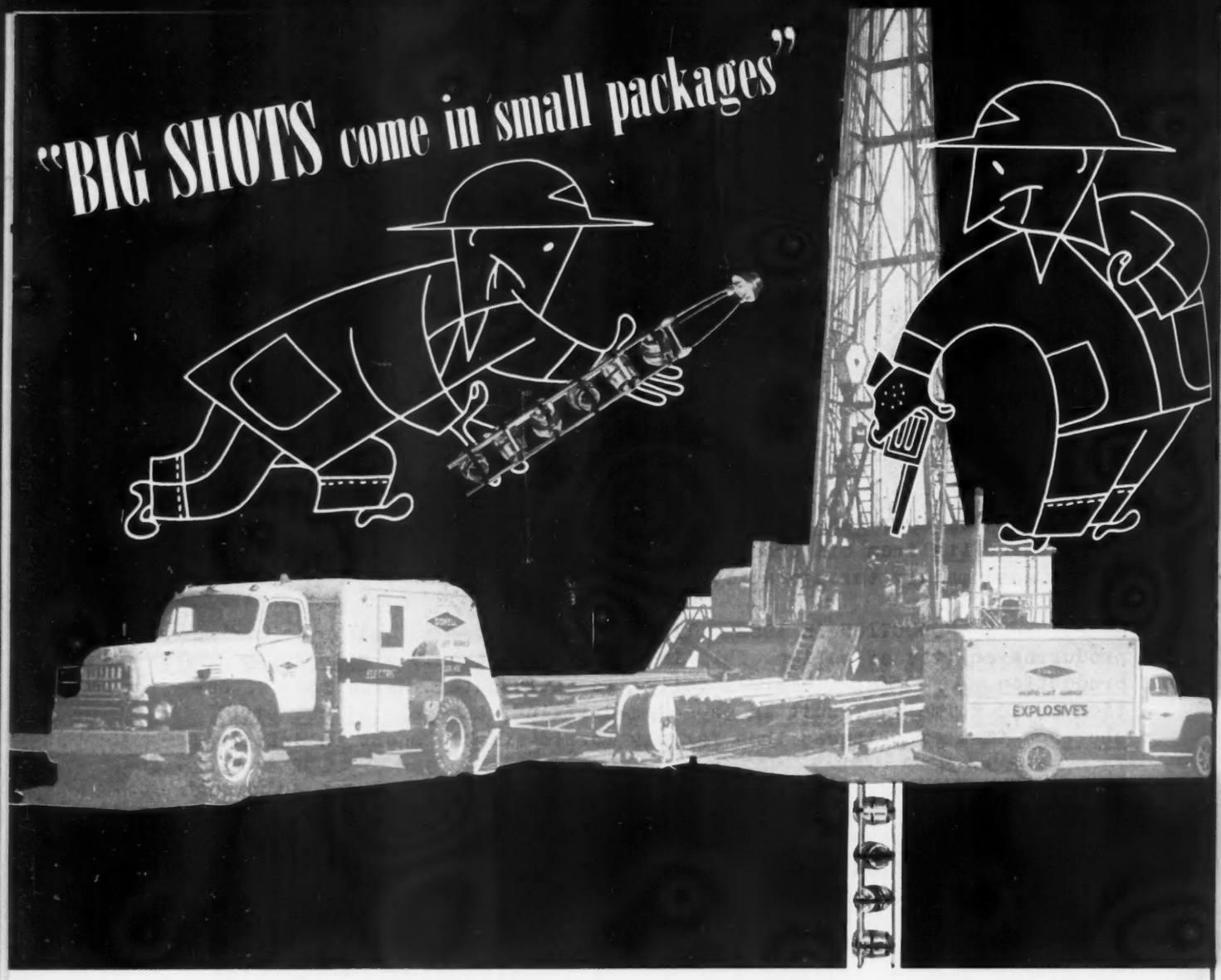
STEPUP IN SCRAP COLLECTIONS is urgently needed to prevent sharp cutbacks in steel production during winter months. Curtailments in steel output now would adversely affect allocations in the second and possibly third quarter of 1952.

IMMEDIATE INCREASE in crude prices appears unlikely, despite increasing pressure from independent producers. Office of Price Stabilization has told Independent Petroleum Association of America that any price increase must be backed with documented evidence of need. To obtain sufficient documentary evidence will require time.

LOOK FOR 20 PERCENT INCREASE in nickel supply during 1952 because of new sources in Cuba and Hudson Bay region. However, nickel will remain in short supply next year.

MIDDLE EAST OUTPUT soon will be greater than before loss of Iranian production of 700,000 barrels daily. Sharp increases in Saudi Arabia and Kuwait already have largely offset Iran's shutdown. Further gains in these countries are in prospect. Another six months will see the completion of a new pipe line which will permit Iraq to step up production by another 275,000 barrels daily.

OIL COMPANIES are following general U. S. trend of special training for executives. Ten percent of country's leading firms have now adopted such programs, which include rotation of men among variety of jobs, use of trainees on company advisory committees, conferences on operating techniques, and university courses on management. Training comes high—sometimes as much as $25,000 per man.



DEEPER PENETRATION with Dowell Glass Gun in casing perforating or open hole shooting

When you ask for Dowell Perfo-Jet Service, you receive the latest advancements in oil and gas well perforating! Now, Dowell has developed an expendable Glass Gun that allows the use of a larger explosive charge than do other types of guns. This extra detonating power gives you deeper, surer penetration of casing, cement and formation. Comparative "Standard drum tests" through 7" O. D. casing into cement and sand show the following results:

	Penetration	Hole Size
5" diameter jet perforating gun	8¼"	½"
Dowell expendable Glass Gun	12"	⅞"

Dowell's new Glass Gun is being used to good effect both in casing perforating and in open hole shooting. It consists of glass-enclosed, shaped charges in an expendable aluminum carrier . . . and can be tailor-made to fit a wide variety of shooting patterns and hole diameters. This self-destroying gun assures you of a junk free hole.

Call Dowell for your next perforating job. Ask for more detailed information on this new development.

DOWELL INCORPORATED
TULSA 3, OKLAHOMA
Subsidiary of The Dow Chemical Company

DOWELL

PERFO-JET SERVICE

Ask your nearest Dowell station for complete information on these Dowell services and products: Acidizing Service, Electric Pilot Services, Plastic Service, Chemical Scale Removal Service for heat exchange equipment, Jelflake, Paraffin Solvents, Magnesium Anodes for Corrosion Control, and Bulk Inhibited Hydrochloric Acid.

"First in Acidizing . . . since 1932"

Look to DOWELL

FOR OIL INDUSTRY CHEMICAL SERVICE

Editor's Page

COMPETITION WILL SOLVE SPRABERRY PROBLEMS

FROM the maze of data being collected and distributed on the vast and relatively new Spraberry trend, the one point which stands out vividly is that much remains to be learned about this very unusual formation.

Even what is known presents a conflicting picture. Whereas the oil industry is accustomed to treating every reservoir as a separate and distinct entity in determining the most efficient development and producing method, the Spraberry is far more complicated in that practically every well differs from its neighbor. Is the Spraberry a sandstone or a silt? Are there any optimum completion practices? Does the oil come from the fractures or the body of the formation? Many believe the Spraberry has more oil in place than even the great East Texas field, but fear that only a small portion of this oil can be recovered. Can enough of the oil be produced to make it financially successful and worth all the steel required to fully develop the vast area involved?

The many new and complex questions created by the Spraberry constitute a genuine challenge to the best brains of the oil industry. Fortunately, many competing companies and individuals are probing into the perplexing problems arising from this spectacular oil discovery.

Only an industry in which the power of competitive forces operate freely can expect to find a solution to the Spraberry problems. A monopolized industry, or even one hampered by excessive government interference, would walk away from such an awesome task to seek more easily produced fields. At some future date the Spraberry will stand forth as evidence of what can be achieved under the incentive system of just awards to those who find the answers. Those who would foster socialism or nationalization should watch carefully the significant producing developments ahead for the Spraberry, and take lasting heed.

UNREALISTIC OIL PRICES DANGEROUS

THE GOVERNMENT ATTITUDE on oil prices is unrealistic and may lead the U. S. to the brink of oil scarcity. Since no industry is more vital than oil in the nation's current mobilization program, this country would be rendered defenseless without an adequate supply of petroleum.

Although it is generally recognized that a maximum effort should be made to expand producing capacity, and much effort and thought is being devoted to this problem, all will be of little avail if crude price ceilings are kept at disparity with the general economy.

Unlike many commodities, the price of crude did not increase in the six-month interim between outbreak of the Korean War and the imposition of prize freezing regulations. In fact, the national average crude price today stands at $2.57 per barrel, 3 cents less than the average price in 1948.

History has demonstrated conclusively that drilling and development operations are directly related to the price and income received, a sound and equitable price providing both the funds and incentive to enlarge producing capacity.

The Office of Price Stabilization should recognize that equitable prices are one thing and that disparity prices are another, in addition to realizing the dangers of unrealistic price policies.

Warren L. Baker

Are you Saving pennies and wasting dollars?

Unless you are using Baker "Whirling" Cementing Equipment, you probably are wasting valuable rig time in *running* and *cementing* casing.

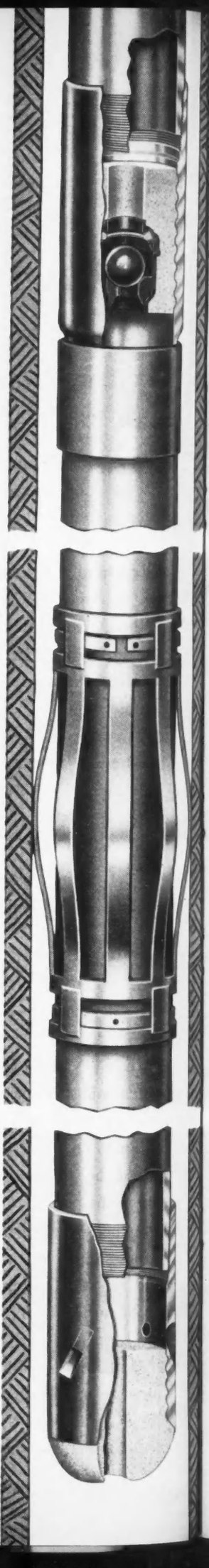
It takes mighty little wasted rig time to pay the difference in cost between ordinary shoes and Baker "Wash-Down Whirler" Shoes which do the *best* possible cementing job in the *shortest* possible time.

Here's the hook-up you need

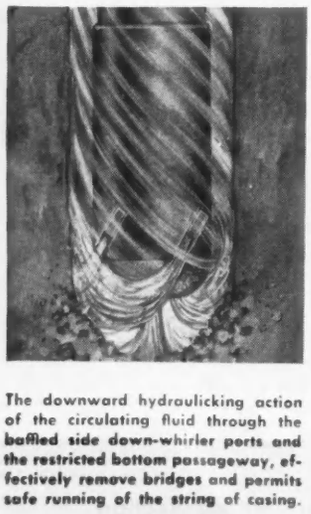
See at right the Baker Wash-down Whirler Guide Shoe which removes bridges, conditions the hole, and whirls the cement to assure complete encasement of the casing which is centered by a Baker Casing Centralizer. If your well is extra deep, use a Baker Wash-Down Whirler *Float* Shoe in place of the *Guide* Shoe, and have two float valves in the string. The Baker Cement Float Collar, up the string, not only serves as an efficient back-pressure, or float valve, but provides a stop for the cement plug.

You won't waste *any* time with this hook-up—and see below why it is always your best bet for cementing casing.—Specify, and be sure you *get*, Baker "Whirling" Cementing Equipment.

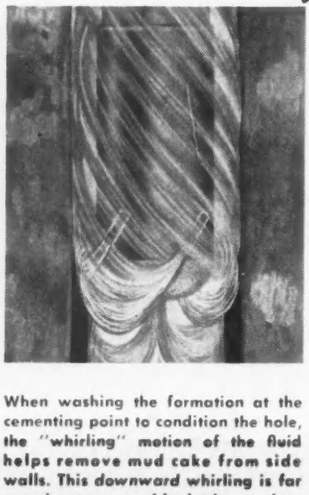
BAKER OIL TOOLS, INC.
Houston • Los Angeles • New York



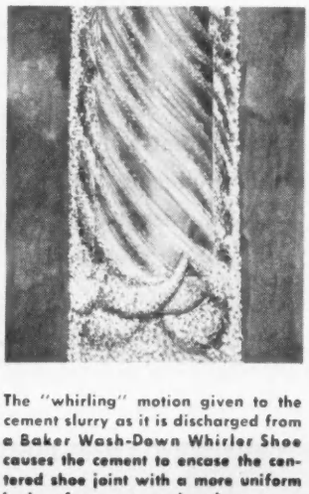
Here is visual proof of what *whirling* does for you...



The downward hydraulicking action of the circulating fluid through the **baffled side down-whirler ports and the restricted bottom passageway, effectively remove bridges** and permits **safe running of the string** of casing.



When washing the formation at the cementing point to condition the hole, the **"whirling" motion of the fluid helps remove mud cake from side walls. This *downward* whirling is far superior to any *side jetting* action, and does not cause caving or crumbling of soft formations.**



The **"whirling" motion given to the cement slurry as it is discharged from a Baker Wash-Down Whirler Shoe causes the cement to encase the centered shoe joint with a more uniform body of cement, and reduces to a minimum the hazard of channeling.**

The Changing Panorama

Filling of Vacancy On FPC Highly Important

FEW MATTERS during the next months will exceed in importance the appointment by President Truman of someone to fill the vacancy now existing on the five-man Federal Power Commission. More than the future government regulation of gas or oil is at stake, as operations of FPC may determine whether consumers have an adequate supply at equitable prices. Consequently, the decision is equally important to a huge and growing segment of consumers as well as to the oil and gas industry.

Appointment of a man with leanings toward greater government regulation might stop or retard the recent swift development of natural gas supplies, which has made it possible for natural gas to become available to more and more parts of the country at prices far below competitive fuels. President Truman probably will favor the appointment of someone who stands for government regulation. This was indicated by his veto of a Congress-approved measure which would have specified that the FPC did not have jurisdiction over prices or production at producing wells.

Big Business Proves It Has Big Heart

BIG BUSINESS has a heart. Pension plans, retirement funds and other benefits have become a growing part of business operations in recent years. In addition, there are increasing numbers of other examples of the "heart" of business.

For example, Continental Oil Company and Western Natural Gas Company have directed operations on Blackjack Peninsula on the Texas Gulf Coast so as not to disturb the winter habitat of the Whooping Crane, among the tallest and rarest birds on the North American continent. At additional expense, the companies re-mapped a planned barge canal and other facilities, rather than encroach upon the birds' wintering grounds. Last spring the companies went so far as to hold up drilling until eggs in a nearby nest were hatched. Fittingly, the National Audubon Society has presented the two companies with the society's citation of merit. This is the first time an Audubon award has been presented to a commercial organization.

Another instance of big heartedness in big business is the expansion of Phillips Petroleum Company's educational fund for children of employes. As a result of the company's directors appropriating $100,000 to enlarge the scope of this program, 50 children will be awarded scholarships each year instead of only 12. Since the fund was established, 138 scholarships have been awarded, and at present there are 40 young people in college under such scholarships.

Geophysicists Told To Use Tools Better

IN ORDER for this country to maintain a productive capacity of 2¼ billion barrels of oil next year, geophysicists must improve their use of available tools.

Speaking before the fifth annual midwestern meeting of the Society of Exploration Geophysicists, Dr. B. B. Weatherby of Amerada Petroleum Corporation, Tulsa, said that geophysicists are not making complete use of the tools they have available for seeking oil, either by not using all of the latest instruments or because they do not have men trained to use them to the fullest advantage. He declared that geophysical contracting companies, which do 60 percent of seismic exploration work, and oil companies' geophysical departments must make better use of existing tools in order to cut down dry hole waste, and that they must obtain the latest in instruments and work out methods of giving thorough training to more men.

Dr. Weatherby also pointed out that the distribution of seismic effort is poor. Too many crews are working old producing areas that have been shot 20 or 30 times. Through the use of better instrumentation and interpreting techniques oil fields still are being found, but they are getting smaller and smaller. Dr. Weatherby would like to see a greater portion of effort directed to what he called the "wide open spaces" of the North Central and Rocky Mountain states where big fields may be expected.

Conservation Walks With Cooperation

AN EXAMPLE of the success that can be achieved by conservation through cooperation between land and minerals owners and oil companies was revealed when Shell Oil Company sponsored a tour of its Benton, Ill., water-flood project for oil writers and newspapermen from the North and East. For some of the visitors the trip was the first through the oil fields, and the oil industry garnered lots of compliments for its efficiency.

The Benton water-flood is in Franklin County, and Shell is operator for itself and three other firms, W. C. McBride, Inc., Burr Oil Company and J. W. Menhall. Ten years ago the pool was producing about 33,000 barrels of oil per day and then dropped off to about 730 barrels daily two years ago. In less than two years production has increased to 7500 barrels per day and is expected to reach 12,000 barrels. Already the first million barrels of water-flood oil has been recovered.

W. A. Alexander, Shell vice president and manager of the Tulsa area, declared the success of the project is an outstanding example of what can be done for conservation when all involved cooperate. The pool which yielded some 20 million barrels of oil under primary methods is expected to recover an additional 12 million barrels through water-flooding. Alexander also pointed out that the success of the project shows what private enterprise can accomplish when it is unhampered by government restrictions.

The Benton flood is a unique operation. An unusual feature is that the Tar Springs sand is found at approximately 2200 feet and lies 1400 feet below an operating coal mine. Wells were drilled through pillars of coal which acted as retaining walls for the coal mine and special casing was used in completing the wells. In order to protect the coal diggings operators agreed to limit surface injection pressures to 1000 pounds per square inch.

The success at Benton has aroused considerable interest in water-flooding of other depleted fields in the Illinois Basin. The frank approach to the problem which marked Shell's activities while unitizing the block has created an atmosphere of confidence and understanding among landowners.

Report from the Observatory

OUTLOOK IMPROVES AS STOCKS DROP

By RAY L. DUDLEY, Publisher, and WARREN L. BAKER, Editor

GREAT IMPROVEMENT occurred in petroleum's economic position during recent weeks. Highly encouraging was a downward turn in heretofore steadily-mounting U. S. inventories, which were on the brink of becoming excessive. A noticeable increase in demand starting late in October as colder-than-normal weather spread over much of the nation, coupled with a reduction in November output, were the important factors responsible for the improvement.

The outlook was for further stock reductions, except for the usual seasonal climb in gasoline, and therefore for further improvement. Demand should be greater, December normally being colder than November; and December production will be less than in November due to another Texas allowable cut amounting to 72,500 barrels daily.

However, the many uncertainties of the coming winter months dictate need for continued careful attention to trends and quick adjustment of operations to indicated desirable rates.

• • •

BIGGEST CURRENT PROBLEM, and one steadily growing more serious, was the maldistribution of crude oil stocks, with inventories stacking up in West Texas and Mid-Continent regions, while more crude was needed on the Texas Gulf and Atlantic seaboards. This situation was the result of insufficient pipe line capacity to move West Texas oil to the Gulf Coast, a handicap which cannot be cured for another year, when additional outlet facilities will be completed. Meanwhile, with adequate pipe line capacity into the Mid-Continent, too much West Texas crude was moving northward.

The immediate solution, obviously, would be curtailment of West Texas production to eliminate excess quantities going into the Mid-Continent without curtailing present shipments to the Gulf Coast. Admittedly, this action would involve considerable adjustment and shifting of crude between different pipe lines if an over-all reduction in West Texas allowables was imposed.

Following a sharp buildup during October, over-all U. S. crude stocks stood at 263.1 million barrels in mid-November, over 18 million above a year ago and more than the 255-million barrel mark generally considered adequate. However, at this level inventories were not as high as indicated, the gain being confined primarily to the West Texas-New Mexico and Mid-Continent regions, where 15.2 million more barrels were in storage than a year ago at this time. In contrast, the Texas Gulf Coast inventories were down 825,000 barrels from 1950 volumes.

Some reduction in over-all crude stocks may occur during the remainder of November, and slightly enlarged drafts were in prospect for December as a result of the additional curtailment of Texas output and anticipated greater demand. Nevertheless, it was problematical whether the Texas cut would relieve the chief headache—which is not so much quantity as distribution or location of stocks. Although West Texas output for December was trimmed more than other areas in the state, the already short Gulf Coast region also received a reduction. West Texas crude likely will continue piling up in that area and the Mid-Continent while the Gulf Coast grows shorter.

• • •

THE BRIGHTEST SPOT was the downward turn during the past month in heretofore rising refined product inventories. Much of the previous worry over the possibility of excessive product stocks was eliminated by recent trends, greatly enhancing prospects for 1952.

Storage of the industry's four leading refined products receded to 292.0 million barrels by mid-November, 3.6 million barrels below the October peak. This reduced the margin of gain over 1950 volumes to 25.7 million barrels in contrast with being 33.1 million barrels larger just a month ago.

Biggest factor in the inventory improvement was the first downward movement in distillate fuel stocks as the first wintry blast was felt from the Great Lakes to the Gulf. While mid-November margin of distillate stocks over year ago levels was 13.3 million barrels, the spread was narrowed by 5 million barrels the past month, having stood at 18.3 million in mid-October. Continuation of cold weather could quickly reduce distillate fuel inventories to year ago levels.

Equally important was the continued contra-seasonal demand for gasoline. Abetted by military and higher-than-normal export demand, motor fuel inventories now are only 4.9 million barrels above 1950 volumes, whereas in September 8 million more barrels were in storage than a year before. Gasoline stocks will commence a seasonal increase now, but if demand continues to hold up they will not be excessive by the start of the motor fuel consuming season next April.

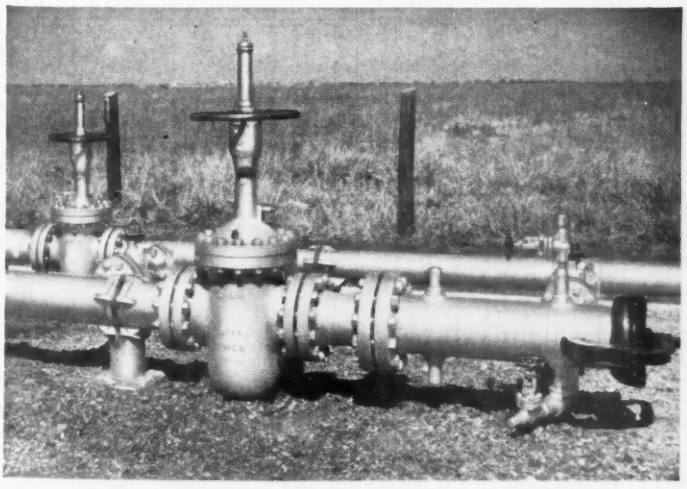
for smoother flow
easier operation
longer service life

...CRANE *CLASS 600*
OIL AND GAS PIPE-LINE VALVES

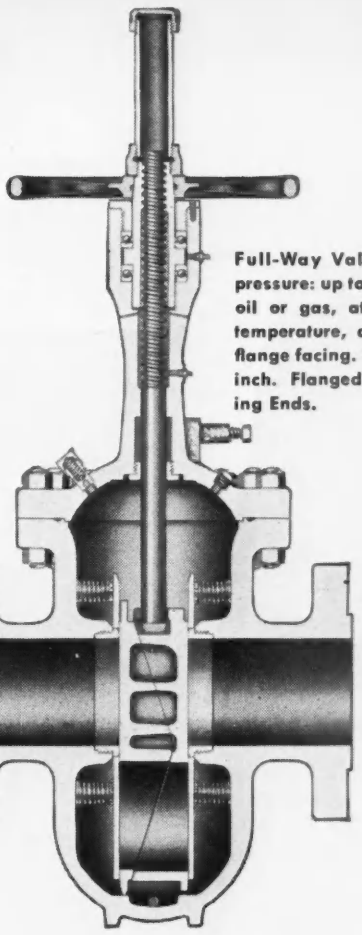
You get many advantages with these conduit-type, double-seating Crane Pipe-Line Gates. For example, smooth, full flow with minimum restriction . . . no turbulence. Circular disc ports—in perfect alignment with seat openings—eliminate pockets. This Crane design feature helps assure tight closure.

Grease packed body and bonnet assure easier valve operation . . . less maintenance. All working parts are lubricated to reduce friction and wear. And since Crane double-seating design seals off seating faces from line flow, seat erosion is eliminated.

For further information, see your Crane Representative or write for Circular AD-1864. No obligation.



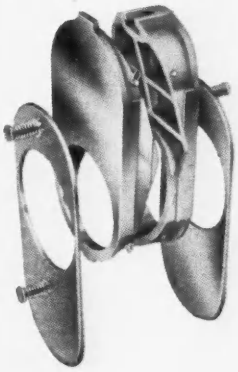
Crane cast steel pipe-line gate valves on scraper trap in crude oil lines.



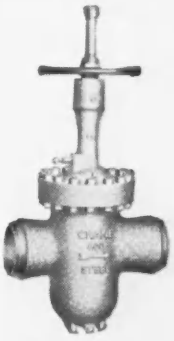
Full-Way Valve. Working pressure: up to 1440 pounds oil or gas, at atmospheric temperature, depending on flange facing. Sizes: 2 to 30-inch. Flanged or Butt-Welding Ends.

COMPLETE GREASE SEALING

Movable spring-loaded plates prevent grease entering line flow while valve is being operated . . . also close "conduit" openings in disc against entrance of grease.



In addition, plates wipe foreign matter and excess grease from disc faces and assist in guiding the disc. Readily accessible fitting in bonnet permits easy addition of grease when needed.



Venturi Type, available with flanged or butt-welding ends.

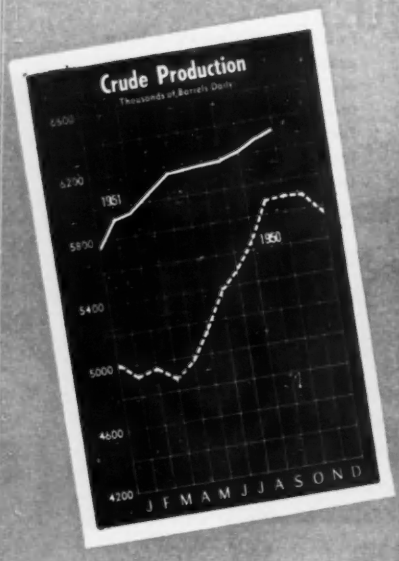
CRANE CO.

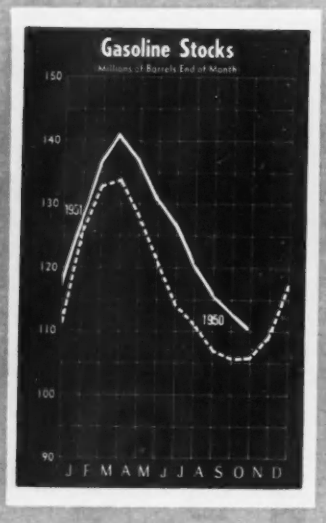
General Offices:
836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

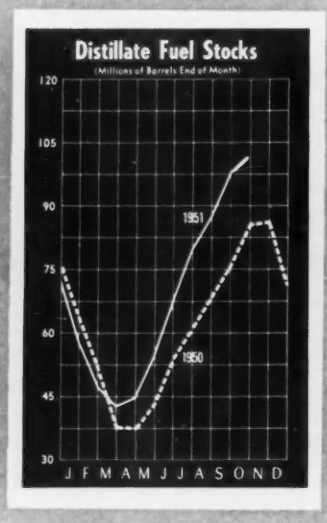
VALVES • FITTINGS • PIPE • PLUMBING • HEATING

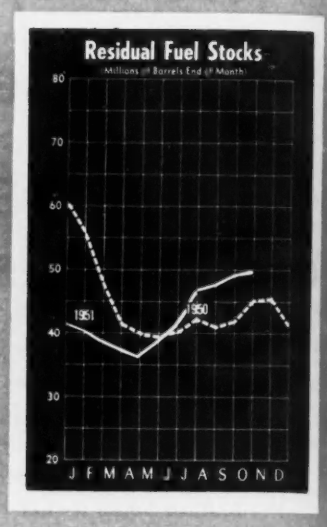
Petroleum

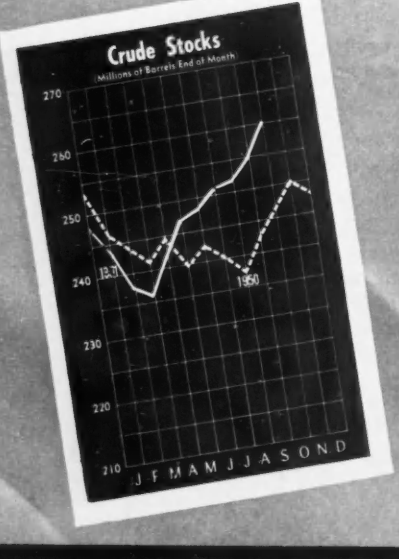
By CECIL W. SMITH,











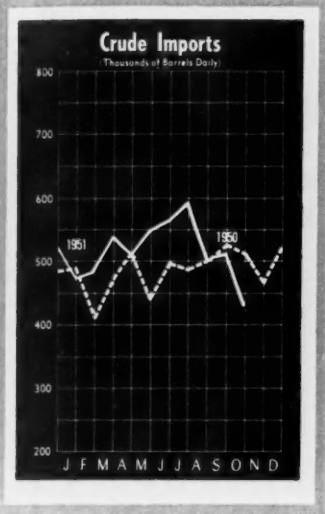
U. S. Crude Production by States

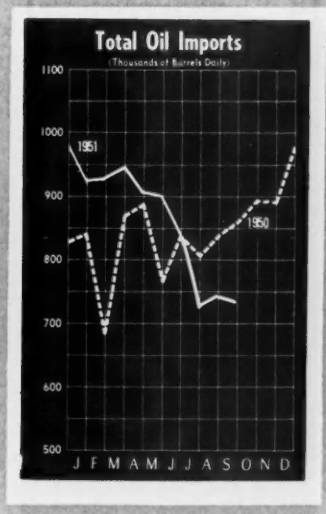
(THOUSANDS OF BARRELS)

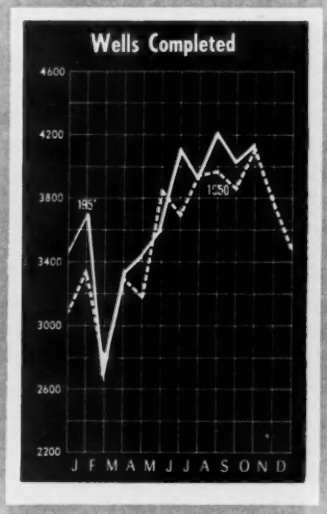
STATE or DISTRICT	DAILY AVERAGE PRODUCTION				TOTAL PRODUCTION First Ten Months		
	October, 1951	September, 1951	October, 1950	% Diff. Oct., '51-'50	1951	1950	% Diff. '51-'50
Alabama	3.0	3.0	2.4	+ 25.0	871	575	+ 51.5
Arkansas	82.1	81.7	85.3	— 3.8	24,802	26,051	— 4.8
California	988.4	981.7	950.4	+ 4.0	294,970	269,194	+ 9.6
Colorado	78.4	78.1	70.6	+ 11.0	22,663	18,780	+ 20.7
Florida	1.6	1.7	1.5	+ 6.7	495	389	+ 27.2
Illinois	170.7	168.4	171.0	— 0.2	49,493	51,908	— 4.7
Indiana	33.1	31.0	28.7	+ 15.3	8,710	8,307	+ 4.9
Kansas	320.0	320.4	301.4	+ 6.2	95,409	89,099	+ 7.1
Kentucky	33.0	31.8	32.9	+ 0.3	9,261	8,502	+ 8.9
Louisiana	649.2	655.7	599.7	+ 8.3	193,512	171,918	+ 12.6
North Louisiana	125.3	125.2	119.4	+ 4.9	36,528	36,904	— 1.0
South Louisiana	523.9	530.5	480.3	+ 9.1	156,984	135,014	+ 16.3
Michigan	38.3	38.2	42.3	— 9.5	11,787	13,353	— 1.7
Mississippi	106.3	102.0	108.8	— 2.3	31,121	31,795	— 2.1
Missouri	0.1	0.1	0.1	.....	24	24	.....
Montana	25.2	25.7	22.4	+ 12.5	7,513	6,693	+ 12.3
Nebraska	7.5	6.5	7.3	+ 2.7	2,157	1,083	+ 99.2
New Mexico	143.5	144.0	134.1	+ 7.0	43,305	39,780	+ 8.9
New York	13.8	13.9	11.4	+ 21.1	3,683	3,470	+ 6.1
North Dakota	0.1	.....	.....	.....	12	.....	.....
Ohio	9.3	7.9	9.8	— 5.1	2,651	2,856	— 7.2
Oklahoma	507.9	505.8	492.1	+ 3.2	154,572	134,568	+ 14.9
Pennsylvania	29.2	28.3	34.4	— 15.1	9,392	9,894	— 5.1
Tennessee	0.1	0.1	0.1	.....	14	18	— 22.2
Texas	2,899.8	2,866.7	2,608.4	+ 11.2	837,686	676,847	+ 23.8
Dist. 1—South Central	34.9	33.8	31.0	+ 12.6	10,145	8,554	+ 18.6
Dist. 2—Middle Gulf	175.0	169.6	150.0	+ 16.7	49,900	39,847	+ 25.2
Dist. 3—Upper Gulf	514.3	508.6	450.5	+ 14.2	150,592	122,861	+ 22.6
Dist. 4—Lower Gulf-S.W.	270.9	263.6	233.4	+ 16.1	77,958	62,771	+ 24.2
Dist. 5—East Central	55.3	57.2	42.9	+ 28.9	15,920	10,646	+ 77.1
Dist. 6—Northeast	393.8	397.7	397.7	— 1.0	118,395	108,410	+ 9.2
Dist. 7-B—North Central	86.6	83.7	78.3	+ 10.6	25,104	20,843	+ 20.4
Dist. 7-C—West Central	117.6	115.0	70.8	+ 66.1	31,111	18,016	+ 72.7
Dist. 8—West	1,005.8	993.0	871.4	+ 15.4	284,649	215,159	+ 32.3
Dist. 9—North	161.4	159.7	154.1	+ 4.7	47,245	43,632	+ 8.3
Dist. 10—Panhandle	84.2	84.8	90.0	— 6.5	26,695	27,663	— 3.5
Utah	3.5	3.7	3.6	— 2.8	1,122	986	+ 13.8
Virginia	0.1	0.1	0.1	.....	14	18	— 22.2
West Virginia	7.9	7.7	8.0	— 1.3	2,318	2,382	— 2.7
Wyoming	181.4	186.1	173.1	+ 4.8	56,790	49,354	+ 15.1
Total United States	6,333.5	6,290.3	5,899.9	+ 7.3	1,864,347	1,617,844	+ 15.2

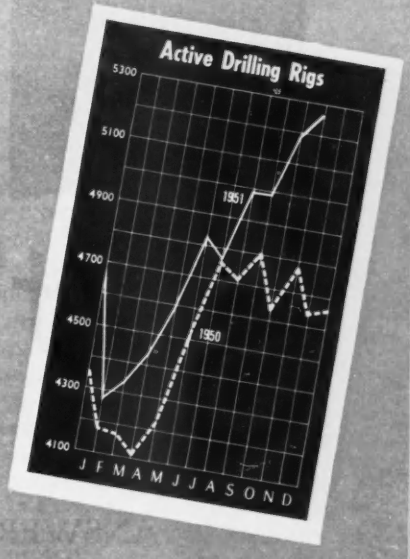
Trends in U. S.

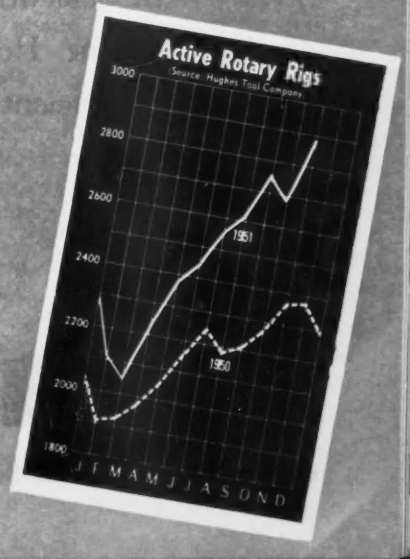
WORLD OIL Staff







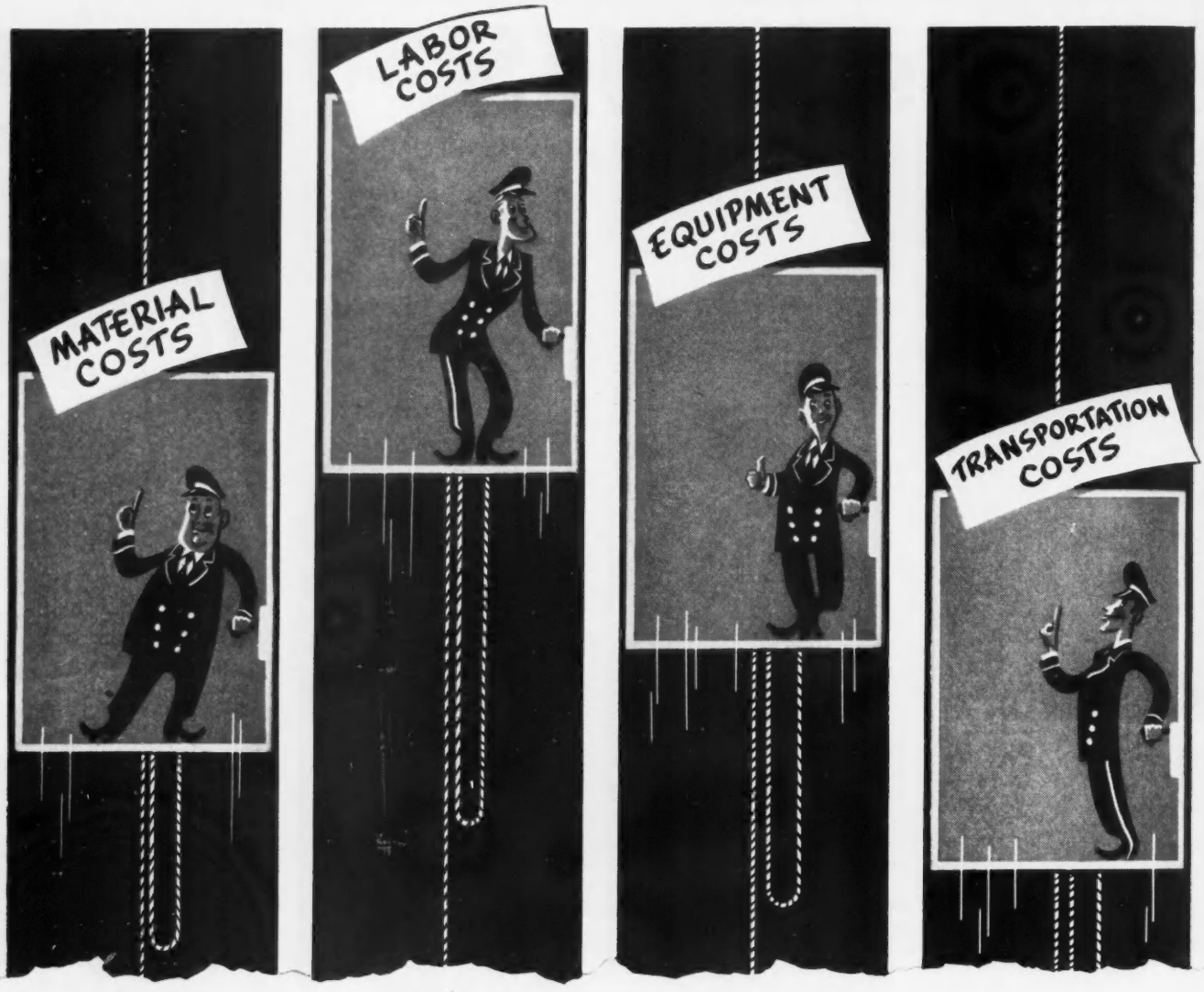




Crude Oil and Refined Products Trends

(THOUSANDS OF BARRELS)

MONTH	CRUDE OIL			GASOLINE		DISTILLATE FUEL		RESIDUAL FUEL		DAILY IMPORTS	
	Production Daily	Runs to Stills Daily	Stocks End of Month	Production Daily	Stocks End of Month	Production Daily	Stocks End of Month	Production Daily	Stocks End of Month	Crude Oil	Total Oils
1949:											
October...	4,997	5,373	250,932	2,643	103,287	1,001	90,643	1,141	68,673	492	785
November.	5,210	5,293	256,010	2,594	104,707	962	88,212	1,180	65,112	435	703
December.	5,024	5,475	253,356	2,633	111,521	1,032	75,207	1,203	60,193	485	828
1950:											
January...	4,922	5,483	246,610	2,575	125,298	1,048	63,932	1,209	55,808	487	841
February..	4,967	5,316	243,750	2,552	132,796	1,026	52,206	1,172	47,828	411	684
March....	4,878	5,336	241,098	2,539	133,766	938	37,777	1,154	41,860	471	869
April....	4,968	5,193	244,605	2,508	128,057	977	37,530	1,048	39,979	511	888
May.....	5,143	5,535	239,877	2,647	121,035	997	42,739	1,063	39,482	439	766
June....	5,378	5,655	242,287	2,748	114,074	1,037	53,679	1,069	40,124	498	838
July....	5,484	5,882	240,270	2,835	111,055	1,040	62,555	1,140	42,165	486	806
August...	5,665	6,067	237,393	2,932	107,067	1,089	68,426	1,148	40,979	501	839
September.	5,888	6,059	242,311	2,849	105,748	1,180	78,270	1,178	41,966	525	859
October...	5,900	6,077	246,424	2,875	105,764	1,217	85,643	1,250	45,004	510	896
November.	5,891	6,085	250,016	2,859	109,005	1,218	86,113	1,240	45,048	466	891
December.	5,758	6,092	247,814	2,872	117,220	1,307	70,875	1,280	41,184	521	979
1951:											
January...	5,907	6,450	243,107	2,962	128,479	1,427	58,424	1,368	40,317	499	977
February..	5,930	6,562	235,247	2,906	137,243	1,419	47,587	1,382	39,409	468	937
March....	6,052	6,469	233,824	2,908	141,456	1,327	42,978	1,348	37,516	483	861
April....	6,127	6,183	243,180	2,821	139,188	1,171	44,736	1,230	36,910	511	871
May.....	6,170	6,436	248,418	3,031	132,261	1,210	55,273	1,265	39,317	518	876
June....	6,130	6,575	248,170	3,100	127,595	1,254	67,839	1,277	41,566	563	876
July....	6,141	6,462	250,847	3,091	121,482	1,228	79,437	1,275	45,163	546	788
August...	6,232	6,539	254,276	3,114	114,446	1,237	87,432	1,226	47,243	529	780
September.	6,290	6,590	255,307	3,097	112,653	1,298	97,983	1,220	47,956	517	741
October...	6,333	6,483	261,171	3,114	110,203	1,320	102,575	1,210	48,825	429	734
Oct., 1951 Change:											
In Month.	+43	—107	+5,864	+17	—2,450	+22	+4,592	—10	+869	—88	—7
In Year...	+433	+406	+14,747	+129	+4,439	+103	+16,932	—40	+3,821	—81	—162
Week Ended:											
11-17-51..	6,267	6,616	263,120	3,159	110,381	1,384	100,429	1,343	48,434	455	837
11-18-50..	5,882	6,002	245,116	2,815	105,468	1,176	87,117	1,255	45,600	518	884



What's MISSING in this picture?

ANSWER: Halliburton cementing prices! While the cost of practically everything has soared, your dollar actually buys more in cementing service today than in 1924. Look for the answer in the Howco policy of passing on to customers the economies of efficient, large-scale operations.

Erle P. Halliburton

Chairman of the Company

HALLIBURTON OIL WELL CEMENTING CO.

Duncan, Oklahoma

Monthly News Analysis

Petroleum Faces Critical Pinch for More Steel

The oil industry will feel a more critical pinch on steel supplies during the first three months of 1952, and probably during the first six months. Steel allocation for petroleum and natural gas operations during the first quarter of 1952 have been set at 1,708,500 tons, a cut of 98,000 tons from the fourth quarter of 1951.

The reduction was generally viewed as distressing, being considerably below the 2,085,000 tons which the Petroleum Administration for Defense thought necessary for minimum operations. Consequently, it appeared that insufficient steel would be available for all the industry's operations.

In announcing the allocation of steel, both Charles E. Wilson, defense mobilization chief, and Manly Fleischmann, defense production administrator, said the first quarter of 1952 would be the toughest period in the defense program so far as steel was concerned and forecast only little improvement for the second quarter.

Drilling operations may fare better than other activities. PAD was allotted 466,000 tons of casing and tubing for the first quarter, of which 409,250 tons are for domestic operations. This amount is about the same quantity available in the current quarter.

Pipe line operations, especially oil lines, will fare better than heretofore. For the first quarter of 1952, PAD was allotted 368,000 tons of line pipe, against a request of 400,000 tons. This compares with a total of only 514,000 tons allotted during the first six months of 1951, an average of 257,000 tons per quarter.

As far as plate for storage tanks was considered, the industry was allotted 65,000 tons, although it requested but 63,000 tons. However, out of the 65,000 tons the industry must supply some of the military's sizable oil tankage construction program.

Despite the improvement in the line pipe situation, George A. Wilson, PAD's director of supply and transportation, warned those attending the API meeting that "sufficient steel will not be available for all pipe line and storage projects in the first or even the second quarter of 1952. On the contrary, many good projects that should be finished soon will have to be delayed until late 1952 and perhaps in 1953 unless substantial improvement in the availability of materials is achieved."

The availability of steel may be even more severe than indicated by allotment figures, because of the growing backlog of approved allotments which were not filled during the third and fourth quarters of 1951. On this phase, Wilson asserted that "by the latter part of October, we already had been forced to revalidate more than 37,000 tons of line pipe into the first and second quarters of 1952 because it could not be obtained in the quarters when originally allotted. We are continuing to receive requests for revalidations and it appears that the final total of such shifts from the last two quarters of 1951 into 1952 likely will be quite sizable."

Wilson asserted that experience in obtaining steel with approved allotments for "tank construction has been even more discouraging than in the case of line pipe. A considerable portion of our third and fourth quarter allotments had to be shifted to subsequent quarters. Already more than 20 percent of the total tank steel allotted for the fourth quarter has been revalidated into subsequent quarters." He predicted that "more than 25 percent of our fourth quarter tank steel ultimately will have to be revalidated into subsequent quarters."

Of necessity, the revalidation of allotments into subsequent periods will reduce the amount of steel available for additional projects and operations.

Increased supplies of critically short nickel and molybdenum were forecast by 1952 by E. V. Bennett, consultant for the National Production Authority, in addressing the API meeting. "We look for a 20 percent increase in nickel next year," he said, "because of new sources of supply." But supply will remain short.

Tubular Allocations Probe Is Planned By House Group

Because PAD received only 84 percent of the steel requested in the fourth quarter of 1951 and only 78 percent of its request for the first quarter of 1952, the House Small Business Committee will launch an investigation in January of oil country tubular goods. Wright Patman, chairman, said the committee would study whether the industry is being allocated sufficient steel and if the amount allocated is being distributed in a fair and equitable manner.

Patman said his group had received a number of complaints "to the effect that gray market pipe is being sold for as much as double the regular commercial price. To determine whether oil country tubular goods have been equitably and fairly allocated, we are interested in obtaining information regarding individual allocations to operators and also the tonnage used and footage drilled by each operator."

PAD is reported seeking permission to publish individual allocations made to 153 large operators, but declares that compiling data on 3000 small operators would be an enormous clerical and computing task. In this connection, Patman asserted, "it would seem that such data should be readily available to PAD in connection with its regular work of making allocations. If this is not the case, it is difficult to see how PAD could make allocations upon a realistic and equitable basis."

In announcing steel allocations for the first quarter of 1952 PAD said U. S. operators drilling more than 11 wells per year would receive primary allotments totaling 272,000 tons of tubular goods, with the remainder going to smaller operators, wildcatters and others without previous drilling records.

About 30,000 tons will be placed in field stocks to satisfy normal development requirements of small operators. Another 22,200 tons will be set aside in 13 regional warehouse centers for emergency use by wildcat operators. Remainder of about 35,000 tons, after allowing about 50,000 tons for mill slippage, will be available for supplemental allotments. Tentative allocations were made for 46,750 tons for foreign operations and 10,000 tons for Canadian operators.

For the first time PAD made public the standards on which it bases allocations. Five percent of the casing, tubing and drill pipe is set aside in field stocks for wildcatters. Allotments for regular operations are broken down into primary and supplemental categories, with 75 percent of the casing and tubing and 90 per-

cent of the drill pipe going to the primary group. The primary allotment is divided between Class A operators (those drilling less than 40 wells in last four quarters) and Class B operators (who exceed 40 wells).

Class A group is further broken down into those who have drilled fewer than 11 wells and those who have drilled 11 to 40 wells. Tonnage allotted each operator is determined on the basis of his previous drilling history, planned drilling operations and amount of tubular goods he has in inventory.

In allocating supplemental supplies, qualified operators who have not recently undertaken oil or gas drilling operations are given first consideration. Whatever tubular goods are left from the supplemental allowance are allocated on a proportionate basis to Class A and B operators filing applications for supplemental allocations.

Wildcat wells receive top priorities, with the following order of priority for other types of wells: (1) extension wells; (2) offset wells; and (3) obligation wells.

New Concept in Oil Search Urged by AAPG President

A new concept in the art of seeking oil was recommended by Frank A. Morgan, president of the American Association of Petroleum Geologists. Morgan, who is vice president and chief geologist for Richfield Oil Corporation, Los Angeles, told the Tulsa Geological Society:

"Our undiscovered reserve of petroleum and natural gas is very great. However, the exploration job of the future will be progressively more difficult. Not only will it require new concepts in costs, in money, manpower and materials, but the demands for results and the responsibilities for discovery are rapidly increasing. Accelerating consumption of oil is the great force of the future which will set the pace for the job of finding new oil."

He added: "I believe the oil industry and the exploration geologists can do the job, but government and landowners, stockholders and the general public must become increasingly aware of the problems and risks involved and do their share to encourage exploration on a broad scale.

"The work of exploration geologists will become more costly and complex; therefore, the costs of non-essential prediscovery items must be kept at a minimum. The reward in event of discovery must be preserved."

Enlargement of Armed Forces Would Hamper Oil Industry

SUBSTANTIAL enlargement of the armed forces beyond the current strength of 3.6 million men would shrink the petroleum industry's output.

In the event of an all-out war the inroads into the industry's labor force would be severe in all categories of employment, regardless of how essential to the defense effort individual jobs might be.

These are the opinions of manpower specialists of the Petroleum Administration for Defense. They estimate that a 10 percent reduction in the present personnel of the producing, refining and pipe line branches of the industry—not a large bit if war should come—would force some cutbacks from current operating levels.

For the industry, the general labor situation ahead, even under only partial mobilization, is one of the shortages of technical personnel. And as the size of the armed forces is increased, shortages may be felt in the ranks of skilled and unskilled labor. This is a situation that must be faced by the petroleum industry during the defense buildup. PAD officials suggest that now is the time for the industry to re-examine training programs with the view of improving methods and techniques to shorten instruction periods for the limited new personnel that will be available to enter the field.

A further increase in the military forces is an immediate possibility. President Truman has under consideration a proposal from military leaders for a larger arms program which would boost the size of the Army, Air Force and Navy to 4 million men, an increase of 11 percent over the present personnel. An increase of this size makes it harder to provide engineers and skilled employes in defense industries, including petroleum, and further limit the number of young men in colleges and in on-the-job training programs.

Equally important, is the number of employes—particularly engineers—who as members of armed forces reserves would be directly affected by a general rise in military personnel on active duty. An estimated 25 percent of all engineers now employed by all industries are members of active and volunteer reserve units. While PAD has adopted a program of assistance to the oil industry in obtaining military service deferments for essential personnel, it has specifically exempted all members of military reserves as eligible for requested deferment assistance.

Should the armed forces be increased to 4 million during 1952, the total in uniform would then be no more than one-third of the peak World War II military strength which was reached in 1945 at 12.3 million men. While any increases in military manpower strength will result in some withdrawals from the civilian labor force, the number of persons actually available for employment is expected to continue to increase at the current rate of about 1 million annually, though some can be expected to be inducted into the armed forces. The present labor force totals 67.5 million, of which about 61 million, excluding the armed forces, are employed.

Unemployment now amounts to about 1.7 million, which could not account for much of a rise in the labor force, if needed. The largest expansion in needed workers is expected to come from the 45 million adults not now in the labor force, of which more than 37 million are women. Nearly 90 percent of the latter are married.

Defense officials predict essential defense production will require a working force of about 8.5 million by the end of 1952. That would be 2.5 million more than now employed in defense industries. It is also predicted that the maximum impact of the preparedness program on labor demand may not be felt until the early part of 1953 in the present schedule of arms buildup, barring a major shooting war.

Petroleum's part in the over-all defense buildup is to provide producing, refining, transportation and storage facilities to make available an additional 1 million barrels of oil daily by 1953. A sizable increase in capacity has been accomplished in 1951 despite no appreciable increase in the industry's total employment—steady at about 1.9 million during the past two years. Nearly half of this total labor force is employed in marketing operations, which during an all-out emergency would be cut back because of civilian rationing.

BETHLEHEM SPECIALTY FORGINGS

FOR OIL-COUNTRY USES

DRILL-COLLAR BLANKS
... rough-turned, rough-bored.

KELLY-BAR BLANKS
... hexagonal section. Blanks are rough-machined all over.

PUMP LINERS
... seamless, one-piece, rough-machined forgings. The collars are integral.

Makers of drilling equipment will find Bethlehem an excellent source of oil-country specialty forgings. Some typical examples of these products are shown here.

Why not talk with us about your needs in this field? We think our type of experience can be helpful to you.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

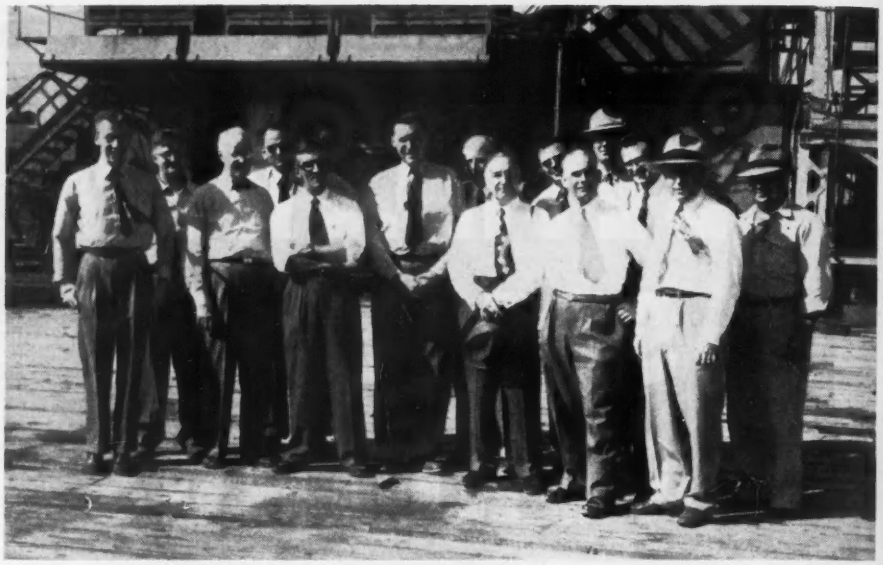
BETHLEHEM STEEL

Texas Slashes Production For Second Month in Row

For the second consecutive month, U. S. oil production in December will fall below the level of the preceding month. This follows a long series of steady increases which began the first of the year.

The reduced December output will be the result of the Railroad Commission setting Texas' crude oil allowable for the month at 2,924,918 barrels daily, which is 72,519 barrels per day under current output and nearly 200,000 barrels below October daily peak.

At the Texas statewide hearing some refiners reported excessive stocks and others said they were short. Generally, it appeared that storage was full in West Texas; up considerably from a year ago in Oklahoma, Kansas, Illinois, Indiana, but short on the Gulf Coast due to inability of pipe lines to move additional quantities from West Texas to the Texas coast.



APPROXIMATELY 35 management and technical personnel from Western Europe's petroleum industry were scheduled to depart from the U. S. December 1 after a six-week study of American oil drilling, production and refining equipment and techniques. The visit was sponsored by the Productivity and Technical Assistance Division of the European Cooperation Administration. Shown in the group at a visit to a Brazos Oil and Gas Company drilling rig near Hempstead while touring Houston and vicinity are, left to right: Richard Wyatt, secretary, OEEC, Paris; L. A. Harris, sales representative, The National Supply Company, Houston; Frank T. Ostrander, petroleum consultant, Productivity and Technical Assistance Division, ECA, Washington; Hans-Heinrich Haarmann, petroleum engineer, Deutsche Erdol-A.G., Heide/Holstein, Germany; Stanley C. MacKenzie, field engineer, Oil Well Engineering Company, Stockport, England; Adolf Winkler, PRAM Oil Exploration Company, Taufkirchen, U. S. Zone, Austria; Cornelius W. de Reus, chief designer, Werf Conrad and Stork Hijsch, N.V., Waarderweg, Haarlem, Netherlands; Karl Grosse, president, Fagro GMBh, Hanover, Germany; Junior Wood, sales representative, National Supply; Henry M. Ballande, President Drilling Company, Societe Nationale des Petroles du Languedoc Mediterraneen, Paris; Oneal Taylor, engineer, National Supply; Jacques G. Dommain, head of inspection and research, Societe de Fabrication de Material de Forage, Tarbes, France; D. E. McMahon, president, Nicklos Drilling Company, and Walter Aymond, tool pusher, Nicklos Drilling.

Tidelands Issue Remains Controversial Center

The Supreme Court made the "right decision" in giving the federal government title to the submerged coastal lands, in the opinion of Oscar L. Chapman, secretary of the interior. However, Allan Shivers, governor of Texas, believes that "the tidelands belong to the states; the national administration is trying to steal them; and I'm against it." The two directly opposing views were expressed during the annual meeting of the API in Chicago last month.

Stating he was "personally convinced" that the proper decision had been made in the tidelands question, Chapman added:

"Arguments have already been made on this subject in the highest forum of the land—The Supreme Court of the United States—and the court settled the argument in favor of Federal paramount power and control."

Chapman continued that as a public servant, "I think it is obvious that the best and only thing I can do is what I have been trying to do all along—that is keep the wheels in motion and to be mindful of the need for the practical development of these oil resources, as soon as possible, under federal auspices, in the best interest of the whole nation."

"The incredibly aggressive and cynical attitude of Washington bureaucrats in the tidelands controversy," Governor Shivers said, "has reached a new high, or low, within the last few days.

"They now propose to invoke the provisions of a federal surplus-property act to take over the control and administration of the tidelands—this in lieu of congressional authorization that they have been unable to obtain.

"In polite language, this would be called 'expropriation without congressional sanction.' In my language, it would be called 'theft without license.'"

No Rationing in Next Year Expected by PAD Director

No rationing of petroleum products is foreseen during 1952, although local shortages may occur during the winter months when transportation facilities are strained by effects of bad weather, C. L. Burrill, program division director of PAD, said at the API meeting at Chicago.

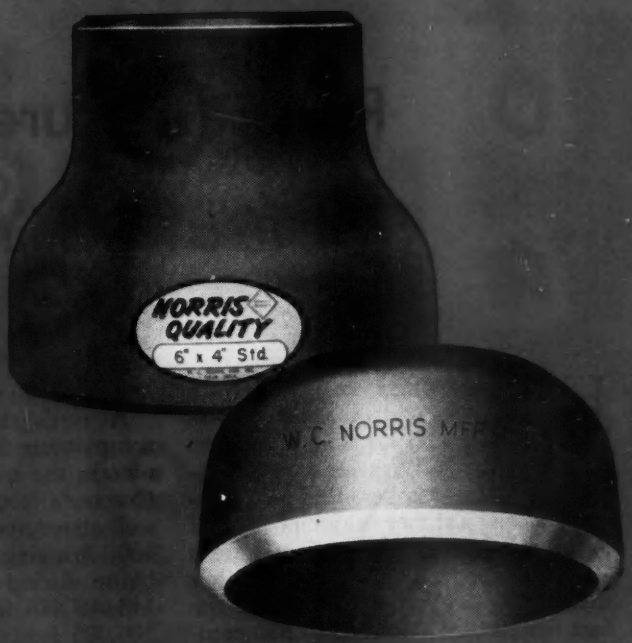
So far as supply is concerned, Burrill stated "it is expected that the industry will be operating throughout the year 1952 at levels which can be met without difficulty."

However, Burrill warned that "some reduction in gasoline quality may take place during the period ahead, depending entirely upon the availability of tetraethyl lead, and particularly the metallic lead necessary for its manufacture." Otherwise, reductions in petroleum product quality during next year are unlikely.

It is expected that increases in consumption of oil products during the last quarter of 1951 and during 1952 will be considerably less than the industry has experienced during the year 1950 and the first half of 1951, Burrill declared. "This tapering off of the rate of increase is the result of several influences. Primarily, the level of business activity has already received most of the stimulation from the defense effort that can be expected. The production of automobiles and oil burners is expected to decline considerably from the extremely high levels reached recently. By the last half of 1952, the impact of the Iranian problem in the United States will either disappear or become relatively minor."

Burrill warned that "we have now reached the point where pipe lines must be constructed before more crude oil can be made available, and the margin in refining and producing operations is relatively small in terms of future requirements.

Fitting Insurance



W.C. NORRIS, MANUFACTURER, INC.

TULSA, OKLAHOMA

WEST COAST DISTRIBUTORS:
REPUBLIC SUPPLY COMPANY OF CALIFORNIA,
Los Angeles

Since QUALITY NORRIS PRODUCTS 1882

BRANCHES:
HOUSTON, KILGORE, ODESSA, TEXAS;
SALEM, ILLINOIS; CASPER, WYOMING

EXPORT: 30 ROCKEFELLER PLAZA, NEW YORK CITY

Record Assured For 1951 Drilling

IT IS NO longer a question of whether a new drilling record will be established in 1951, but a question of by how much. With 4162 wells completed during October, this year's activity closed another major portion of the narrowing gap separating it from 1950's all-time high of slightly less than 44,000 completions. During the first ten months of 1951, 37,650 completions were marked up, only approximately 6300 short of the record year.

August's slightly more than 4300 completions and 16 million feet may remain the monthly record for 1951. October's completions resulted in a well-above-average footage of 15,905,150, bringing this year's cumulative figure during the first ten months to 143,087,476 feet—an increase of 10,786,085 feet, or approximately twice the percentage increase achieved in completions. Each well drilled thus far this year has averaged slightly more than 3800 feet deep, while the average depth for 1950 was 3666 feet.

The nation's five top drilling states contributed 27,338 completions, as compared with 25,898 during the comparable period in 1950, an increase of 1440 completions. It is significant that of the five, only one experienced a drilling decline. That was Illinois, which reported 1998 completions for the first ten months of this year and 2394 for the like period of the previous year. Texas, the leading state in completions, reported a rise from 14,123 in 1950 to 15,082 in 1951; Kansas, up 178 to 3480; California, from 1543 to 2059; and Oklahoma completions rose to 4719, 183 more than reported for the previous year.

Of the total new wells drilled during October of this year, 2100 were oil wells, 1593 dry holes, 277 gas wells, and 21 distillate completions.

Well Completions in the United States During October, and First Ten Months, 1951

(Figures compiled by WORLD OIL Staff from private reports and other sources as follows: Illinois from Illinois Geological Survey; Indiana from Indiana Division of Geology; Missouri from Missouri Geological Survey; Tennessee from Tennessee Division of Geology; Bradford, Kane-Clarendon and Allegany fields of Pennsylvania and New York from the "Producers Monthly.")

State or District	MONTHLY COMPLETIONS, OCTOBER, 1951									TOTAL COMPLETIONS				CUMULATIVE TOTALS January-October					Rigs in Operation (Drilling, Rigging-Up and Shut Down)		
	NEW WELLS								Total Drilled Deeper												
	Oil	Dist.	Gas	Dry	Water Input	Gas Input	Water Disposal	Total New		Oct., 1951	Sept., 1951	Oct., 1950	Footage October, 1951	1951	1950	Percent Diff.	Footage 1951	Footage 1950	Oct. 31, 1951	Sept. 30, 1951	Oct. 31, 1950
Alabama				3				3		3	8	6	17,275	49	37	+ 32.4	238,019	157,464	4	4	5
Arizona											1	1		3	5	— 40.0	6,337	21,363			4
Arkansas	23		2	16				41	1	42	40	25	157,221	354	320	+ 10.6	1,232,683	1,061,189	37	37	36
California	188		7	52				247	8	255	216	136	953,052	2,059	1,543	+ 33.4	7,929,356	6,252,286	271	277	232
Colorado	9		1	22				32	1	33	38	12	156,113	225	67	+235.8	1,088,740	265,878	44	42	18
Florida														3	11	— 72.7	14,614	69,518	1	1	1
Georgia															3	—100.0		13,270			
Idaho												1		1	4	— 75.0	12,844	14,137	1	1	1
Illinois	98		3	131				232		232	243	272	604,092	1,998	2,394	— 16.6	5,002,170	5,181,773	201	217	255
Indiana	46			104				150		150	159	132	280,993	1,102	1,332	— 17.3	2,011,034	2,267,174	182	189	190
Kansas	191		20	149			6	366		366	397	445	1,268,197	3,480	3,302	+ 5.4	11,909,927	10,611,688	434	408	330
Kentucky	47		19	55	1		1	123		123	142	119	261,312	1,089	1,040	+ 4.7	2,228,186	1,923,027	103	103	108
Louisiana	99	13	10	68			1	191	1	192	219	226	1,233,788	1,850	2,064	— 10.4	11,737,917	12,452,129	253	231	229
North Louisiana	53	4	6	38				101		101	127	119	360,661	1,022	1,096	— 6.8	3,887,946	3,832,382	78	78	76
South Louisiana	46	9	4	30			1	90	1	91	92	107	873,127	828	968	— 14.5	7,849,971	8,619,747	175	153	153
Maryland			2	2				4		4	3	2	22,122	30	4	+650.0	126,313	16,636	31	29	
Michigan	16		1	46				63		63	62	90	166,733	595	700	— 15.0	1,489,727	1,666,322	122	110	138
Mississippi	11	1	1	26				39		39	32	26	283,133	312	284	+ 9.9	2,063,486	2,041,950	38	37	28
Missouri											1	3		4	26	— 84.6	2,717	20,500	5	5	6
Montana	18		2	15				35		35	21	30	92,567	235	227	+ 3.5	543,261	566,371	39	58	41
Nebraska	9		1	16				26		26	22	16	136,204	145	90	+ 61.1	691,478	379,357	18	22	13
Nevada														2			15,431		1	1	1
New Mexico	38		12	20				70		70	60	60	381,193	580	521	+ 11.3	2,864,363	2,316,813	187	168	87
New York	24				18			42		42	42	44	60,850	443	644	— 31.2	633,223	945,598	54	58	100
North Carolina																					
North Dakota				1				1		1	1		1,093	8			40,275		6	7	2
Ohio	40		27	26				93	1	94	81	104	186,054	771	839	— 8.1	1,558,764	1,731,062	156	155	161
Oklahoma	282	1	22	212	19	1		537	15	552	460	548	1,944,699	4,719	4,536	+ 4.0	16,857,908	16,026,452	649	615	692
Oregon																					1
Pennsylvania	62		24	5	59	7		157	1	158	143	157	272,899	1,297	1,374	— 5.6	2,227,351	2,508,921	244	262	255
South Dakota															5	—100.0		16,922	3	3	1
Tennessee														6	3	+100.0	7,465	3,993	7	8	8
Texas	838	6	64	575	3			1,486	27	1,513	1,534	1,604	6,789,690	15,082	14,123	+ 6.8	65,681,508	59,818,572	1,835	1,829	1,481
Dist. 1 S. Central	18			25				43	1	44	44	51	126,326	511	417	+ 22.5	1,419,217	1,176,623	51	35	38
Dist. 2 Middle Gulf	22		5	28				55	1	56	73	87	333,768	638	586	+ 8.9	3,747,686	3,372,184	78	58	61
Dist. 3 Upper Gulf	67	1	7	46				121	6	127	123	123	809,397	1,290	1,319	— 2.2	8,031,105	7,796,838	124	144	150
Dist. 4 L. Gulf-S.W.	60	3	5	51	1			120	1	121	137	138	592,647	1,423	1,380	+ 3.1	6,987,826	6,653,903	119	122	118
Dist. 5 E. Central	11		1	24				36		36	47	17	191,182	404	165	+144.8	1,652,103	740,170	30	29	19
Dist. 6 Northeast	27	2	5	19				53		53	45	90	284,129	587	557	+ 5.4	3,007,378	2,681,819	43	41	44
Dist. 7-B N. Cent.	83		8	119				210	1	211	291	201	699,007	2,365	1,704	+ 38.8	6,871,780	4,685,335	186	206	135
Dist. 7-C W. Cent.	98		3	37				138	3	141	134	116	692,085	1,239	806	+ 53.7	5,717,820	3,228,188	253	220	82
Dist. 8 West	279		4	47	1			331	9	340	302	365	1,985,485	3,362	3,537	— 5.0	18,345,236	18,938,868	558	567	547
Dist. 9 North	145		5	169	1			320	5	325	219	265	895,127	2,500	2,745	— 8.9	7,471,604	7,699,317	269	281	196
Dist. 10 Panhandle	28		21	10				59		59	119	151	180,537	763	907	— 15.9	2,429,753	2,845,327	124	126	91
Utah				2				2		2	3		9,577	27	19	+ 42.1	127,021	67,571	29	31	12
Virginia																			1	1	1
Washington															2	—100.0		16,032	1	1	
West Virginia	16		57	17				90		90	51	56	238,768	535	548	— 2.4	1,524,692	1,401,512	205	215	245
Wyoming	45		2	30				77		77	77	60	387,525	646	501	+ 28.9	3,220,666	2,465,911	98	112	91
Total U. S.	2,100	21	277	1,593	100	8	8	4,107	55	4,162	4,056	4,175	15,905,150	37,650	36,568	+ 3.0	143,087,476	132,301,391	5,260	5,237	4,773

Canadian Exports No 'IF' . . . but 'HOW SOON'

WESTERN Canada's rapidly increasing oil producing potential makes it no longer an "if" but "how soon" will crude from above the 49th parallel invade the U. S. western Great Lakes and Pacific Northwest in volume.

Investment of about $570 million in Western Canada exploration and development since 1946 has resulted in the completion of almost 2500 oil wells and has boosted the area's producing potential from a daily average of 19,000 barrels to the present 195,000 barrels. Estimates are that this will double or possibly trebble within the next few years.

With current daily average production of 165,000 barrels, Canada now is actually one-third, and potentially half-way, toward self-sufficiency in oil. Regardless of whether Western Canada's immediate future production will fulfill the optimistic expectations, there is little doubt the producing potential will continue increasing at a faster rate than anticipated dominion demand. Canada's domestic demand this year, about 375,000 barrels daily, rose 8 percent over 1950. Should it grow 10 percent in 1952, it would amount to no more than 415,000 barrels per day, or approximately twice the present producing potential.

Five years ago, Canada was importing 90 percent of its petroleum requirements from the U. S. and Caribbean areas. Mounting production from Western prairies has had its effects on imports from the U. S. Movement of crude and products from California and West Texas to Canada's West Coast, and of Illinois and Mid-Continent crude to the Sarnia-Toronto refinery area has been reduced to about 75,000 barrels a day this year from a daily average of 136,000 barrels in 1950. This cutback has been effected despite diversion of approximately 20,000 barrels daily of Middle East crude which, prior to the Iranian shutdown had been moving to Canada. This diminishing dependence on imported petroleum has meant for Canada a dollar exchange saving in excess of $150 million annually.

Declining Dependence

Economics of transporting the necessary volume of crude from the fields of Alberta to the more heavily-consuming Ontario-Quebec area; the Eastern region's demand for large volumes of fuel oils for home and industry; and some lack in refinery capacity all indicate Canada may always have some need for oil imports. It promises to be a declining dependence, however.

Presently, Western Canada's crude supplies full requirements of the prairie provinces, averaging about 85,000 barrels daily, and through the 35,000-barrel-a-day Interprovincial Pipe Line and overland rail shipments provides about one-fifth of the Ontario-Quebec demand.

Planned expansion of the 1195-mile Edmonton, Alberta, to Superior, Wis., line to 52,000 barrels per day indicates Alberta's crude in 1952 will account for a much larger share of Eastern demand. This, plus the requirements of the prairie provinces, will total less than the area's present potential output.

To justify large expenditures made so far in developing Canada's petroleum and the indicated future sizable drilling program—there were more geophysical crews in the region this year than ever before—the obvious question of additional outlets for this production have been raised. The first step of utilizing Western's Canada's oil other than for local consumption was initiated last spring with the start of tanker movements of crude delivered by the Interprovincial line across the Great Lakes to Imperial Oil Limited's Sarnia, Ont., refinery.

The second phase is rapidly advancing beyond the drawing board stage. This step is the proposed construction of a $90 million pipe line westward to serve British Columbia and the U. S. Pacific Northwest.

Largely through exchanges, Canada exported in 1950 an average of 200 barrels of crude a day to the U. S. and, since last July, has been furnishing larger volumes after a 4000-barrel daily refinery went on stream at Superior. The limited open navigation season on the Great Lakes for the eastward movement of crude from Superior to Ontario so far has dictated the capacity maximum of the Interprovincial Pipe Line system. With continued rising Western Canadian production, however, and the convenience of the pipe line terminal to the large area west of the Great Lakes, comprising Wisconsin, Minnesota and the Dakotas, further expansion in line capacity could make Western Canada a logical supply source for this area. Except for the recent North Dakota Williston Basin discovery, this has been a petroleum have-not region.

These states and those of the Pacific Northwest, with the exception of Wyoming and Montana, presently are lacking in adequate refinery capacity for local needs and depend for the most part on products refined in other parts of the U. S. But a big expansion in refining capacities in Wisconsin (from 12,000 to 28,000 barrels a day) and Minnesota (from 7500

Trend of Canadian Prairie Oil Development

	1946	1947	1948	1949	1950	1951 (est.)
Leases and Reservations (million of acres)	20	30	56	115	129	145
Geophysical Parties	11	23	59	105	125	140
Exploration and Devel. Expenditures (millions of dollars)	12	25	50	100	165	215
Oil Well Completions	59	196	249	541	797	630
Reserves (millions of barrels)	45	150	500	900	1,100	1,350
Production Potential (thousand barrels/day)	19	24	40	109	168	195

Source: John R. White, Executive Vice-President, Imperial Oil, Limited.

to 72,000 barrels daily) is planned. And should an adequate crude supply be available, it is reasonable to suppose additional capacity could be added to Oregon's 6000 barrels daily and Washington's 5500 barrels daily.

Indications point to the continuance of the U. S. as a net petroleum importer. Present world conditions dictate the need for full development of Canadian oil resources as a convenient and protected source of supply for the North American continent should any future emergency completely or partially cut off Middle Eastern—and even Venezuelan—petroleum to this hemisphere or to Western European nations. Since markets must be available to offer any inducement for proper development of Canada's petroleum potential, eventual consideration of some of the economic barriers to outlets in the U. S. may be required.

Canada's oil future is not only of interest to Canadians but also to the combined U. S. producers, who have the biggest stake in that nation's oil reserves. In this instance, foreign production is not owned solely by a few of the major companies, but ownership also includes a number of U. S. independents who, heretofore, have had only insignificant participation in oil reserves outside the U. S.

Competitive Crude

With the reduction in wellhead prices for Alberta's crude last spring ranging from 25 to 44 cents a barrel, Redwater and Leduc crude by pipe line and tank ship can be delivered to Sarnia and Toronto refineries in the $3.20 to $3.25 a barrel competitive range with crude from Illinois and the Mid-Continent. Crude delivered from the Interprovincial line at Superior for U. S. consumption because of the 21 cents a barrel U. S. import duty is in a $3.25 to $3.40 a barrel range, though Superior is about 800 miles nearer the Alberta fields than Sarnia. At this price, Canadian crude is not competitive with U. S. oil delivered in the western Great Lakes area. In effect, the tariff adds about 300 miles to the pipe line distance from Alberta to Superior.

U. S. duty on crude, topped crude, fuel oils, gas-oil and kerosine, as established by the 1939 trade agreement with Venezuela, is 10½ cents a barrel, subject to an annual quota applied to such imports combined, equal to 5 percent of the quantity of crude processed in U. S. refineries in the preceding calendar year. Imports of these commodities in excess of the quota are taxed at the rate of 21 cents a barrel. The 1950 quota eligible for the lower rate totaled 104,740,000 barrels which had been filled by mid-June. The import duty on gasoline, regardless of volume, is 53 cents a barrel.

Canada, always a comparatively larger net importer of petroleum than the U. S., has tariff regulation permitting crude imports of any quantity to enter duty free but imposes a tax of 33.2 cents a barrel (U. S.) on gasoline and kerosine and 10.9 cents a barrel on residual, distillate and gas oil. This is a measure to protect the Canadian domestic refineries which have total crude capacity of about 325,000 barrels a day, or 50,000 barrels under total demand.

Early in October the U. S. Tariff Commission opened hearings under the Trade Agreements Extension Act of 1951 concerning proposed re-negotiation of the trade agreements with Venezuela on the initiative of the latter. The commission in its findings can recommend action to the president, who in accordance with the Trade Agreements Act of 1934 as amended, has authority to increase or decrease by a maximum of 50 percent any rate of duty that was in effect on January 1, 1945.

As of that date, crude, topped crude and fuel oils import duties were governed by the 1943 trade agreement with Mexico. This agreement, terminated December 31, 1950, established the import tax on these items at 10½ cents a barrel, with no limitation on import quantity.

Under present authority, import tariffs could be reduced to as low as 5¼ cents a barrel with no quota limitation, or could be raised to a flat rate of 15¾ cents a barrel. The latter rate, however, would be less than the total realization under existing regulations.

Any reduction in import duty within the scope of the existing trade acts and agreements would be applicable to imports of petroleum from any source. While such a result would be of economic benefit to the Canadian industry, it probably would not win support of a large segment of U. S. producers who oppose imports as a threat to the domestic industry.

If, from a defense standpoint, it would be desirable to treat the North American Continent as a unit petroleum-wise whereby both Canada and the U. S. could benefit from each nation's available supply toward filling the total North American demand, it might be advantageous to consider need for such a possible mutual exchange and the requisite legislation. As long as it must remain a net importer, the U. S. could find many good points for using Canada's oil.

Civilians Would Need More Oil In Next All-Out War

While military petroleum requirements in another large-scale war would be much higher than consumption in any previous conflict, anticipated essential civilian needs for oil also would be larger according to a survey completed by Defense Transport Administration.

In the event of all-out war, 26 million of the more than 40 million privately-owned automobiles must continue in use to provide absolutely essential services, and this would require production of about 4 million cars annually during the present emergency period. These are the conclusions of a study of data compiled for DTA by the Brookings Institute. The survey's findings indicated that about 30 million automobiles would be needed in the event of a major war to do the comparable transportation work performed by the 25.5 million private cars registered during World War II.

DTA challenged one recommendation of the institute, which stated a gradual stoppage of passenger car production would be required for defense reasons during full-scale hostilities. DTA said a minimum of auto production should be continued during a war because:

- In all-out war the nation might suffer loss of a considerable number of autos within the U. S. due to enemy action.
- An automobile assembly line for passenger cars could be quickly diverted to the production of light trucks, ambulances or other vehicles, should it be necessary.
- Automobiles must be constantly available to replace those worn out by doctors, nurses, policemen, firemen and other emergency workers.
- Mass transportation media, though expanded for wartime needs, would not be able to handle the entire traffic load without continuing aid from private automobiles whose total minimum number in usable condition, therefore, should be maintained.

DTA's recommended production of 4 million units annually would compare with 1950 production of 6.3 million passenger cars and the current annual average of 4.8 million units based on the third quarter production of 1.2 million passenger vehicles.

DTA's estimate that essential services could be performed with 26 million privately-owned units results from the survey's study of present private automobile usage. This found that 95 percent of cars in use perform necessary functions.

PAD FORECASTS:

4.4 Percent Demand Hike in 1952

TOTAL demand for U. S. petroleum in 1952 will average 7,775,000 barrels daily, an increase of 330,000 barrels, or 4.4 percent, over the anticipated requirements for 1951, according to a forecast of the program division of Petroleum Administration for Defense.

The daily average anticipated demand for 1952 is the same as was forecasted by the economics committee of the Independent Petroleum Association of America earlier.

These estimates represent the smallest year-to-year increase in demand since 1949, when total requirements for that year fell below the preceding 12-month period. PAD's forecast of full 1951 demand places the total at 642,000 barrels a day over 1950 and requirements in the latter year were 683,000 barrels daily higher than in 1949.

The anticipated tapering-off in the rate of increase, according to PAD, is the result of several influences:

- The level of business activity has already received most of the stimulation from the defense effort that can be expected.
- Production of automobiles and oil burners is expected to decline

Petroleum Administration for Defense Forecast of Supply and Demand

(Thousands of Barrels Daily Average)

	FIRST QUARTER		Percent Change '52-'51	SECOND QUARTER		THIRD QUARTER		FOURTH QUARTER		Year	Year	Percent Change '52-'51
	1952	1951	1st Qtr.	1952	1951	1952	1951	1952	1951	1952	1951	Full Year
DEMAND—ALL OILS												
Total Demand	8328	7737	+ 7.6	7438	7062	7259	7129	8085	7853	7775	7445	+ 4.4
Domestic	7928	7446	+ 6.5	7038	6655	7009	6618	7850	7439	7454	7039	+ 5.9
Export	400	291	+ 37.5	400	407	250	511	235	414	321	406	— 20.9
Crude Oil	60	89	— 32.6	60	85	60	70	60	61	60	76	— 21.1
Products	340	202	+ 68.3	340	322	190	441	175	353	261	330	— 20.9
MOTOR FUEL												
Total Demand	3029	2732	+ 10.9	3462	3210	3480	3328	3234	3124	3302	3100	+ 6.5
Domestic	2934	2668	+ 9.9	3367	3117	3425	3193	3184	2983	3228	2991	+ 7.9
Export	95	64	+ 48.4	95	93	55	135	50	141	74	109	— 32.1
RESIDUAL												
Total Demand	1811	1826	— 0.8	1493	1543	1384	1409	1724	1719	1602	1623	— 1.3
Domestic	1751	1788	— 2.0	1423	1463	1344	1310	1684	1654	1550	1552	— 0.1
Export	60	38	+ 57.9	70	80	40	90	40	65	52	69	— 24.6
DISTILLATE												
Total Demand	1920	1724	+ 11.4	1052	956	946	942	1594	1513	1376	1283	+ 7.2
Domestic	1835	1693	+ 8.3	972	900	916	847	1579	1452	1321	1223	+ 8.0
Export	85	31	+174.2	80	56	30	95	25	61	55	60	— 8.3
KEROSINE												
Total Demand	529	474	+ 11.6	265	236	219	239	462	455	368	351	+ 4.8
Domestic	499	469	+ 6.4	235	220	214	202	457	233	348	331	+ 5.1
Export	30	5	+500.0	30	16	5	37	5	22	17	20	— 15.0
OTHER PRODUCTS												
Total Demand	934	885	+ 5.5	1061	1022	1125	1098	966	931	1022	984	+ 3.9
Domestic	867	821	+ 5.6	996	945	1065	1014	911	867	960	912	+ 5.2
Export	70	64	+ 9.4	65	77	60	84	55	64	62	72	— 13.9
NEW SUPPLY												
Total New Supply	7851	7454	+ 5.1	7702	7560	7564	7524	7933	7756	7762	7574	+ 2.5
Domestic Crude Oil	6321	5964	+ 5.7	6297	6142	6174	6212	6368	6273	6290	6149	+ 2.3
Natural Gasoline	580	564	+ 2.8	560	542	570	542	590	573	575	555	+ 3.6
Imports												
Crude Oil	500	484	+ 3.3	520	530	520	531	540	530	520	519	+ 0.2
Residual	420	410	+ 2.4	300	316	275	218	400	350	348	323	+ 7.7
Other Oils	30	32	— 6.3	25	30	25	21	35	30	29	28	+ 3.6
STOCK CHANGES												
Total, All Oils	—477	—283	.....	+264	+498	+305	+395	—152	—97	—13	+129	.....
Crude Oil	....	—162	.....	....	+158	....	+ 78	....	....	....	+ 19	.....
Products	—477	—121	.....	+264	+340	+305	+317	—152	—97	—13	+110	.....
***CLOSING STOCKS**												
Total, All Oils	586	557	.....	610	602	638	638	624	629	624	629	.....
Crude Oil	255	234	.....	255	248	255	255	255	255	255	255	.. ..
Total, All Products	331	323	.....	355	354	383	383	369	374	369	374	.....
Gasoline	145	142	.....	131	128	115	112	126	123	126	123	.....
Residual	40	38	.....	41	42	51	48	48	48	48	48	.....
Distillate	44	43	.....	69	68	93	97	84	88	84	88	.....
Kerosine	15	14	.....	25	24	31	34	24	27	24	27	.....
Other Products	87	85	.....	89	92	93	92	87	88	87	88	.....
Crude Runs Required	6691	6492	+ 3.1	6687	6394	6564	6531	6778	6667	6680	6522	+ 2.4

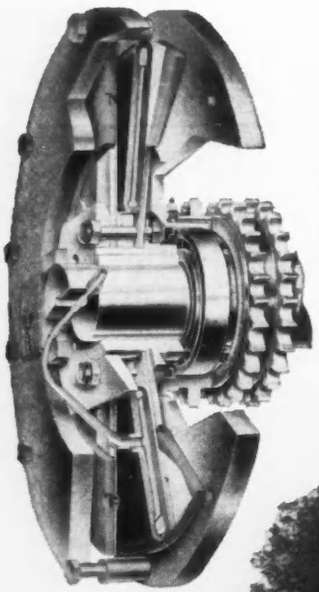
* Stock figures in millions of barrels.

A Masterpiece for Service

3,500-FT. DRILLING

OR 10,000-FT.

WORKOVER . . . . . .



CARDWELL
"FLEX-DISC"
CLUTCH

The Clutch That Has
No Maintenance,
No Down Time,
No Adjustment.

- A Triumph for Economy

A *Natural* FOR FAST MOVES

THIS Cardwell "Trailermast" and Model L draw works is the answer to your problem of expensive, time-wasting moves. The unified assembly of mast and draw works provides an extremely lightweight, portable rig that is moved complete with block fully reeved up. The 96-foot height of the telescoping mast makes "mouse hole" connections possible. "Trailermast" has 150,000 pounds working capacity with a safety factor of 2. The frame is designed so any single engine draw works can be used with the "Trailermast." NO RAMP IS REQUIRED. The 16′ x 16′ derrick floor is high enough for blowout preventers and wellhead connections. "Trailermast" can be used without substructure on servicing jobs or ground level drilling. Write for complete specifications and prices; or see your nearest Cardwell representative.

The Model L draw works, single or double drum, is driven through a 4-speed and reverse transmission (or optional torque converter) to the "Hi-Lo" Cardwell "Flex-Disc" air friction clutched drive. Cardwell "Flex-Disc" air friction clutches mounted in the drums have ample capacity for full engine power without slippage.

Driller's position at base of mast gives full visibility. Mast is erected by hydraulic system and raised to full height with traveling block and drilling line.

CARDWELL
REG. U.S. TRADE MARK PAT. OFFICE
THIS TRADE MARK INSURES HIGHEST QUALITY AT LOWEST PRICE

CARDWELL MFG. CO. INC.
P. O. Drawer 2001 . . . Long Distance Telephones 128—129—130
Cable Address: "ALL STEEL," Wichita—"CARDSTEEL," New York
Wichita, Kansas, U.S.A.

TWENTY-FIVE YEARS CARDWELL SERVING THE OIL INDUSTRY

considerably from the extremely high levels reached recently.

- By the last half of 1952 the impact of the Iranian problem in the U. S. will either disappear or become relatively minor.

PAD stated that although military demand will probably increase during 1952, the total anticipated increase is not large in terms of its effect upon total petroleum requirements.

Domestic demand for all oils in 1952, according to the forecast, will average 7,454,000 barrels a day, up 5.9 percent over estimated requirements for 1951. Demand for U. S. exports, because of steadily increasing production and installation of additional refining capacity abroad, will drop 20.9 percent from the 1951 rate to an average of 321,000 barrels a day. This will represent a sharp reversal from the 1951 trend with total U. S. exports, averaging 406,000 barrels a day, amounted to a 33.6 percent increase over 1950.

Early Peak

Though the actual figures vary slightly, both PAD and IPAA expect total demand for 1952 to reach its peak in the first quarter with the anticipation that exports will drop sharply and some decrease will occur in domestic requirements during the latter part of the year. Previously, total demand has been the greatest in the final three months of the year due to the seasonal expansion in distillate and residual fuel oil requirements.

PAD forecasts domestic and export demand in the first three months of 1952 will average 8,328,000 barrels a day, or 7.6 percent above actual requirements in the like 1951 period. IPAA's forecast for the first quarter placed total demand at 8,170,000 barrels daily, which would be 5.5 percent over the 1951 first three months. These estimates compare with the Bureau of Mines forecast of daily average demand of 8,140,000 barrels for the first 1952 quarter, or an increase of 5.2 percent over the like 1951 period. (See WORLD OIL, November, 1951).

While PAD's forecast for the first three months of 1952 is higher than the expectations of IPAA and Bureau of Mines, its estimate of total demand for the last quarter and the daily average for all of 1951 is below the other two. PAD estimates total demand in the last three months of 1951 to average 7,853,000 barrels daily and requirements for all of the year to run 7,445,000 barrels a day. The revised Bureau of Mines figures for the last quarter and year average 7,913,000 barrels daily and 7,452,000, respectively. IPAA's forecast placed the last quarter average at 7,880,000 barrels daily and the full year at 7,465,000 barrels a day.

Domestic demand for all oils in the first quarter of 1952, according to the PAD forecast, will average 7,928,000 barrels daily, 6.5 percent over the like 1951 period, and will decline approximately 900,000 barrels a day in the second and third quarters and increase to 7,850,000 barrels daily during the final three months of the year. A similar, though less sharp, down-trend in domestic demand was forecast by IPAA; however, the latter expects domestic requirements to increase to a peak of 7,910,000 barrels a day in the last quarter.

PAD estimates export demand for crude and refined products in the first quarter of 1952 will average 400,000 barrels a day, or 37.5 percent over demand in the first three months of 1951. This rate of total export shipments is expected to continue into the second quarter, though in that period it will be below the rate of the 1951 second quarter, and to drop sharply in the second half of 1952, averaging no more than 243,000 barrels daily in the final six months. This trend also was anticipated in the IPAA forecast, though the latter estimated total exports for all 1952 to average 314,000 barrels daily, or 6000 barrels a day less than expected by PAD.

While export shipments of all major refined products in 1951 have been at sharply higher rates than in the preceding year, PAD expects exports of all products in 1952 to average considerably less than in the current year.

Total demand, as well as domestic demand, for all refined products in 1952 except residual fuel oil, however, will show moderate increases over the estimated requirements of 1951, according to the PAD forecast. With export demand expected to be 24.6 percent lower and domestic requirements anticipated to be just slightly less than in 1951, total demand for residual fuel in 1952 is forecast at 1,602,000 barrels a day, or 1.3 percent under the 1951 estimate. Increases in various product demand expected, are: Gasoline, 6.5 percent; distillate, 7.2 percent kerosine, 4.8 percent; and other products, 3.9 percent.

Total new supply (domestic production plus total imports) expected in 1952 by PAD will average 7,762,000 barrels daily, an increase of 2.5 percent over 1951, indicating a daily average withdrawal from stocks during the year averaging 13,000 barrels daily, all of which is expected to be refined products. Such a rate of withdrawal would compare with an estimated daily average increase of 129,000 barrels in total stocks during 1951. Based on these calculations of PAD and its estimate of closing 1951 inventories, it would indicate total stocks at the end of 1952 would amount to 624 million barrels, or 5 million less than the expected level on December 31, 1951. Crude inventories during 1952 are expected to continue at the anticipated closing level of 1951 of 255 million barrels.

New Supply

The estimated total new supply in 1952 will consist of daily average domestic crude production of 6,290,000 barrels, natural gasoline output of 575,000 barrels a day, and total imports of 897,000 barrels daily. Of the latter, crude would consist of 520,000 barrels a day, approximately the level expected for all 1951. Product imports in 1952, however, are expected to rise to 377,000 barrels daily, compared with the estimated average of 351,000 barrels a day in 1951, indicating total 1952 imports will be 27,000 barrels a day higher than in 1951.

PAD's estimate of 1952 domestic crude production is 2.3 percent higher than the anticipated average for all of 1951, and consists of a daily average output of 6,321,000 barrels in the first quarter, 6,297,000 in the second, 6,174,000 in the third, and 6,368,000 in the fourth quarter. It will not be possible to increase domestic crude production much over a level of 6,353,000 barrels a day until additional pipe line capacity is provided, particularly in West Texas, according to PAD. The agency expects 300,000 barrels daily of West Texas-Gulf line capacity to be added in the third quarter and 70,000 barrels daily in the same period with completion of the Platte line from Wyoming to Wood River, Ill. The 209,000-barrel daily Rancho line from West Texas to Houston is expected to be completed in the fourth quarter of 1952, according to PAD.

Just as in Drake's Day

'Last Drop' of Oil Sighted

By ROBERT E. SPANN
WORLD OIL Staff

IN 1866, only seven years after Col. Drake's successful venture at Titusville, Penn., the U. S. Revenue Commission said synthetic-produced fuels would be available if oil production should end. At approximately five-year intervals since, some misguided person in one government bureau or another has jarred the nation with a wistful prediction that the last drop of oil to be produced in the U. S. was in sight.

In 1951, 92 years and 43,362,923,000 barrels of oil production later, Secretary of the Interior Oscar L. Chapman has sighted the last drop of petroleum. But unlike the other prognosticators, he is ready to take remedial action, backing up his belief with a substantial sum of the taxpayers' 53-cent dollars. To provide the "incentive" for initiating a commercial synthetic fuels industry, Chapman requested in the name of national defense that $455 million be set up as government "borrowing power" to back up the proposed coal hydrogenation and oil shale production with taxpayer guaranteed price floors. His request recently was reduced to $100 million under the terms of the revised Defense Production Act.

Chemical Difference

Chemically, the chief difference between coal and petroleum is that the latter has a higher hydrogen content. Coal, with the proper injection of hydrogen, can be made to produce the same things provided in ample supply by oil. Economically, the difference between gasoline made from coal after a shot of hydrogen and crude oil—produced motor fuel is either 30.5 cents a gallon cheaper for oil, or 2.1 cents a gallon cheaper for coal. This depends on whether the cost estimates of the National Petroleum Council's synthetic liquids committee or estimates of the synthetic fuels promoters of the Bureau of Mines are used. The former was made after 16 months of study by 12 industry experts. How much study went into the latter is unknown.

In any event, Chapman has deemed it necessary to have a coal hydrogenation plant of 30,000 barrels daily capacity in operation by 1955—the earliest possible completion date according to the most ardent government supporters. Masterful mathematics is required to justify economically and defense-wise the expense necessary to play around with coal's molecules to produce liquids on a commercial scale.

Chapman blandly discarded such opposition against the project as:

- NPC's committee report which found that production of 216,000 barrels daily of synthetic liquids would require an outlay of $4.2 billion and 1,710,000 tons of steel for eight coal hydrogenation plants. Estimated costs of catalytic gasoline from coal would be from 41.4 to 43.5 cents a gallon.
- A confidential report of some top Petroleum Administration for Defense officials citing strong arguments that defense needs do not justify the need for liquids from coal now or within the next ten years at least.
- The unsuccessful attempts of numerous privately-financed oil companies to find an economical method of coal hydrogenation.
- Repeated promises of top industry officials that when economics justified such a venture, private capital would be ready, willing and able to produce synthetic liquids in volume.
- Some opposition, at least, from top Bureau of Mines personnel.

Against this majority, Chapman seeks to foster a government-supported synthetics industry. He has been aided by a similar desire of W. C. Schroeder, chief of the bureau's synthetic liquid fuels branch, whose latest cost estimates show that gasoline can be produced from coal hydrogenation at from 10.75 to 10.9 cents a gallon. The bureau estimated that only 1,699,000 tons of steel would be required to build plants with production capacity of 240,000 barrels daily, and that the cost of a single plant would be approximately $411.4 million. This compared with NPC's estimate of $533 million for a single plant, $4¼ billion for eight plants.

Apparently Chapman has at least some reservations about the bureau's figuring, for he subsequently ordered an independent study be made of the conflicting costs estimates. Ebasco Services, Inc., has been contracted to try to determine the cost of a hypothetical 30,000-barrel-daily plant if located at Rock Springs, Wyo., and in Union County, Ky.

Shale Study

While strongly opposing the building of commercial coal hydrogenation plants, the NPC committee recommended that the developments in oil shale indicate that industry should give this process continued attention. It found the costs of producing gasoline from oil shale from present known methods would be from 14.7 cents to 16.2 cents a gallon, or not much above present costs of crude-produced motor fuel.

At the time the synthetic fuels committee was making known its research results, another NPC group reported that given 3,231,000 tons of steel, an additional 1 million barrels of oil daily could be made available to consumers from the U. S., Canada and Venezuela. In other words, less than twice the steel would make available nearly five times as much liquid products as the synthetic dream. Estimated cost of the additional 1 million barrels daily was placed at $965 million, exclusive of exploration and production costs. The committee refused to give an estimate on the latter, but total costs of the additional 1 million barrels daily can be conservatively estimated at less than the $4¼ billion required for one-fifth as much coal-hydrogenation production.

Conserve Manpower and Materials

- *WHAT MANAGERS CAN DO*
- *WHAT ENGINEERS CAN DO*

By H. H. ANDERSON, Vice President, Shell Pipe Line Corporation, Houston

CONSERVATION of manpower and materials now is urgently essential in the petroleum industry, especially in view of its requirements for specialized workers and large quantities of metal goods that are scarce. There are many opportunities open to both managers and engineers for achieving savings in work and equipment. Numerous ways in which such savings can be made are here suggested. This constructive discussion of an important problem was presented originally as a dinner address at the sixth annual conference of the petroleum division of the American Society of Mechanical Engineers at Tulsa, Sept. 24-26.

ON every hand even a half-alert observer can see opportunities for conservation of manpower and materials which now is urgently essential.

A good definition of "conserve" is "to preserve from waste or loss." Thus, "to preserve from waste," we must minimize manpower inefficiency and wastage of materials in work accomplishment. "To preserve from loss," we should eliminate unproductive work where the expenditure of manpower and materials, however efficient, is fruitless. In today's emergency, all manpower and materials so conserved should find immediate, productive, and more profitable placement within our own expanding demands for new essential work.

Opportunities for saving manpower and materials in the petroleum industry are open to engineers as well as managers, and the possibilities include saving of "engineer-power."

"Why should engineers listen to management problems?" Technical ability alone will not suffice the ambitious engineer. To control the forces and materials of nature, he must be able also to direct the human effort required for such control. He need not be able to finance his projects, but he should be able to justify them cost-wise. Industrial management involves coordination of men, materials, and money. Thus, at least in the oil business, successful engineers are managers are heart.

The engineer properly works for technical or mechanical advance. The manager must also advance the cooperation of rank and file to achieve results. One management problem is to get the engineer to relate his effort to the over-all objective. Conservation depends as much on betterment of attitude and method as it does on mechanical improvement. Thus, the engineer serves conservation best when he thinks in terms of practical supervision as well as technology.

What Managers Can Do

What can managers do to conserve manpower and materials?

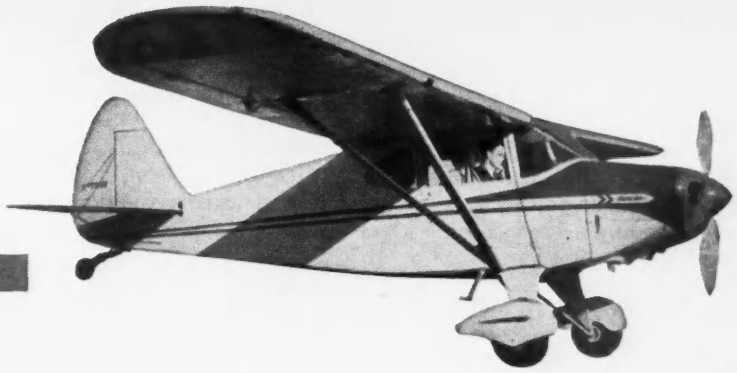
IMPROVE EMPLOYE MORALE: Where possible, the prime thing is to improve employe morale. This requires constant study of — and improvement in—salary, wages and benefit plans, office and plant conditions, supervisor attitudes, delegations of responsibility and authority, and other things affecting morale. Employe morale is a state of mind or attitude. More than any other thing, high morale will impel each worker to increase his work outturn, and to reduce his waste of materials and supplies.

PROMOTE SAFETY: Next is promotion of safety. The most loyal work force may be accident-prone unless safety is always stressed. Safety is "out of sight and out of mind." But when loyal workers are made safety-conscious, they abhor and avoid the absenteeism, and the breakage and spoilage of equipment and materials, that attend accidents.

START IMPROVEMENT AT TOP LEVEL: The morale of employes stems from, and reflects the attitude of, the top executives. Thus, improvement must start with the top, after which it can be spread down through the chain of command to the front-line foremen. If top management adopts fair employe policies, and if it trains the supervisors at all levels in their sympathetic execution, the attitudes of the rank and file will improve. Then they will work harder and waste less. Where such a program goes sour or doesn't click in one segment, the trouble may be in the local supervisor's attitude.

ENCOURAGE EMPLOYE SUGGESTIONS: Loyal employes want to help

solid cross-country performance *plus economy!*



That's Why, in 1951, More People Have Bought Piper Pacers and Tri-Pacers Than Any Other Type of Plane

Faster, more flexible, more convenient transportation—that's the advantage of a company-owned or personal airplane. "Less expensive, too" is an added *plus* with the sensational Piper Pacer or Tri-Pacer.

The latest four-passenger Pipers, with the heritage of Piper's 20 years of plane-building experience, provide solid cross-country performance—better than 120 mph cruising speed (134 mph for Pacer Model "135"), ample fuel for long range, and quiet, comfortable cabins—at much less cost than any other personal airplane.

They make plane ownership practical for the first time for many businesses and individuals. And the Tri-Pacer, with simplified controls and tricycle landing gear, makes flying so easy that people have soloed after only one day of instruction.

Fly the Pacer or Tri-Pacer—compare price, performance and low operating cost—you'll buy Piper, too.

PIPER AIRCRAFT CORPORATION

LOCK HAVEN, PENNSYLVANIA

MUCH NEW FOR '52. Many fine new features for added performance and comfort are incorporated in the Pacer and Tri-Pacer for 1952. See your Piper dealer or write for Pacer brochure to Dept. L-12.

the company to succeed. Perhaps overrated as often as maligned is the employes' "suggestion box" plan for stimulating and collecting their ideas. But where this formal plan is not in vogue, managers should carefully provide other channels through which such suggestions will be voiced, considered, and put into use if good. Simple ideas can lead to much conservation. In fact, the opportunities for conservation are often best seen on the scene!

CUT RED TAPE: Niagaras of time, energy, and ambition may be salvaged by cutting internal red tape. Flagrant is the narrow-minded chief who must straddle everything, even requiring the simplest contact to be made in his name. Most juniors can be trusted to use good sense in their job routine, and to refer policy questions to the supervisor, when dealing directly with other sections, departments, or divisions, or with suppliers and customers. Thus, routine contacts should be encouraged at the lowest rank consistent with policy control.

DISCOURAGE NON-CONFORMANCE: Larger departments may have several division offices. All may have similar objectives that can be accomplished under common policies. But among them are local chiefs and section heads who will recognize common denominators, while others are blind to all but the differences in their problems. The conformers work amenably under the common policies, but the dissenters contend (and constantly) that everything must be tailor-made to serve peculiar needs. Here changes in division heads may conserve the senior planning time and energy lost in such contention.

COORDINATE POLICY PLANNING: Planning-time also can be wasted by the home office heads. Suppose they are keeping plans for new projects, procedures, or policies under wraps. The need may have been seen also in several of the divisions, with resultant duplication of effort. Either the liaison between offices is poor, or their common problems are not widely and frankly enough discussed. Time wasted by a foreman may affect only the scope of his crew, but the time wasted in the planning offices can adversely affect a dozen foremen and their crews, if not the whole organization.

REVIEW MANPOWER NEEDS PERIODICALLY: Crews and work equipment always build up as scope of work increases. But when the work levels out or declines, supervisors may neglect or are reluctant to lay off or transfer unneeded men conformably. Then each worker reduces his productivity, or crews "make" work to keep occupied. Regularized reviews of work force versus needs will indicate warranted force reductions. This goes as well for the clerical and engineering staffs.

(BUT DON'T NEGLECT RECRUITMENT): Our zeal to save manpower should not cause us to neglect recruitment of qualified youngsters for our staffs. Most companies are shorthanded at best with additional workdemands arising daily; and all are short-sighted if they neglect the continued training of replacements for senior technical and executive staff. Immediate use can be made of recruits to relieve more experienced men of essential routine, and thus allow them to spend additional time in planning and directing.

REDUCE FIELD REPORTS: The contingent losses from needless or poorly-planned "paper work" are many. Floods of reports are demanded from the plant and field. The bulk of these are on forms to be prepared by foremen who have little skill as amanuenses. Some foremen could more appropriately be called "form-men." These many forms should be constantly reviewed for need and context, and thrown out or simplified to the limit. Then each foreman can give more attention to his prime duty of job planning and direction to increase productivity and reduce waste.

IMPROVE COST STATEMENTS: Reams of statements are issued by our accountants. Their intended—if not actual—use is to assist management to increase revenues and to control costs. They can serve this high purpose only when they disclose controllable elements. Department managers may want to see costs segregated to show WHO is responsible. But superintendents can more effectively control costs with statements that show WHAT is responsible, such as labor, materials, vehicles, power and fuel. Better planning of all cost statements will improve the tools for cost control and conservation.

REVIEW EQUIPMENT NEEDS PERIODICALLY: Also, as field production declines, periodical review will disclose equipment units that are no longer needed, or may be replaced by much-smaller units. Today, especially, we should search for hard-to-get large capacity items—such as tanks, pumps, and the like—now working at low use-factors, that may be replaced by small units which can do the job by operating longer hours if necessary. The smaller equipment with increased use-factors will save money and, with the smaller pumps, the reduced pressures will conserve line maintenance.

CONTRACT CONSTRUCTION: What about contracting work? The most efficient use of men and tools occurs when the force is stabilized to optimum size. This can best be done when work is limited to daily-recurring tasks. Most operating companies recognize this by contracting major construction, and some now contract many minor jobs. If the smaller contractors can obtain enough such jobs from several operators, they too can stabilize their forces.

CONTRACT MAINTENANCE: Operators usually keep a few mechanics and small crews on hand for emergency repair or maintenance; and they strive to keep these meanwhile employed. As with construction, when larger or unusual maintenance jobs arise, they may avoid building up the force by contracting the work. But the smaller maintenance jobs — if intermittent — also lend themselves to contract for over-all conservation.

USE BLANKET CONTRACTS: The contracting of smaller jobs of construction as well as maintenance can be simplified—yet kept competitive—by use of two or more open or "blanket" agreements with local contractors. These may set out all contractural conditions and job specifications, but leave the unit prices to be bid in each desired case. The laying of short lines, tank-cleaning, painting, and even well-pulling, can be so handled to good advantage.

DON'T OVER-DEFER MAINTENANCE: Our zeal to conserve should not cause us to unduly postpone protective maintenance. If industry is reduced to privation, there may be no choice. But we can ill afford to chance complete renewal of vital plant through such deliberate delay. Critical losses of plant outturn would occur during the renewal period; and our conservation program would boomerang. Here is a real dilemma, however, because present high tax rates urge us to do maintenance that can safely be postponed. This, too, frustrates conservation.

DON'T OVER-CONSERVE CAPITAL: With less and less net profit retention in sight, our appraisal of capital

Pick any reason from 1 to 9

1 POSITIVE SETTING

The big, inter-locking slips hold fast without damaging the casing.

2 LEAK-PROOF PACKOFF

...longer sealing element has packed off ...ccessfully under differential pressures as ...igh as 10,000 psi.

3 FASTER RUNNING IN FLUID

Greater clearance means easier running.

4 NO WAITING FOR CEMENT TO SET

You have your plug, right where you want it, right now!

Tomorrow's Tools -Today!

5 EASY TO DRILL OUT OR KNOCK DOWN

4 to 6 hours is enough, with either rotary or cable tools.

6 RESISTS PRESSURES EITHER UP OR DOWN

Opposed slips just set tighter with any increase of pressure from either direction.

7 NO WORRY—

You know you have a plug.

8 OUTLAST THE CASING—

On permanent installations such as false bottoms or abandonments.

9 ECONOMICAL—

In time and money both.

YOU ALWAYS WIN WITH A

LANE WELLS

Drillable BRIDGING PLUG

General Offices, Export Office and Plant • 5610 Santa Fe St. • Los Angeles • Houston • Oklahoma City • Lane-Wells Canadian Co. in Canada

projects is distorted. Given any choice, management tends to reduce today's capital outlay by increasing tomorrow's operating and maintenance expense. This expedient should be applied with care if we are to remain in business. Even in normal times, too much capital penny-pinching can create an incubus for posterity. If conservation is our aim, each new project alternative should be appraised with the future as well as the immediate use of men and materials in mind.

USE LABOR-SAVING EQUIPMENT: Much manpower can be saved by use of more modern work equipment and tools. Addressographs and calculators, or bull-dozers and airplanes may be in short supply at this time. But each is designed to speed up work, to reduce errors, and to conserve muscles and supplies. Consider the pipe line air patrol. One pilot with a tiny plane can do a job that used to require 30 to 40 linewalkers.

USE AUTOMATIC DEVICES: Other manpower can be saved—and other benefits be gained—by use of automatic protective devices. For example, in some pump stations these can reduce attendance by 75 percent. Again, automatic tank shutoffs and air bleeders in field gathering lines will reduce labor, reduce internal corrosion, and increase line flow. Also, they may permit removal of several pumps and engines for other uses.

ENCOURAGE CORROSION CONTROL: Most oil industry equipment is metallic and is subject to corrosion. Apathy to its control can be laid to managers who are slow to see the direct losses from corrosion, and to connect the indirect losses with their cause. But the fault is not all theirs. Some of their engineers and operators have failed to sell them on the value of control measures. These, of course, cost money that requires budget approval. Thus, education of management in the economic value of corrosion control is prerequisite to the great conservation it can achieve. This includes explaining the cooperation needed to avoid cathodic interaction.

ENCOURAGE CORROSION PREVENTIVE PRACTICES: Operators, too, can conserve metal by avoiding corrosion. For example, during construction as well as operation, needless underground corrosion can be prevented by avoiding the disposal of waste matter or effluent where it may pollute the soil in or near the plant. Effective surface draining will minimize this likelihood.

ENCOURAGE JOINT VENTURES: Most-exceptional opportunities, requiring management support as well as engineering know-how, are the joint ventures becoming common in the oil business. We see the pooling of interests in foreign development. But at home, too, are fine examples of joint action to build refineries and pipe lines, and to unitize field development and field plant operation. Building a single large facility instead of several small ones permits a minimum use of new equipment, supplies and services per unit of capacity. Here is conservation to really brag about.

CONSIDER OIL FIELD UNITIZATION: A further boon attends unitization of producing properties. This permits efficient reservoir control, affording maximum ultimate recovery of the oil and gas. Thus, we conserve natural resources as well as the manpower and materials required for their development. Oklahoma has taken the lead in legislation to override shortsighted minor obstruction of oil and gas field unitization.

What Engineers Can Do

Opportunities for engineers to conserve general manpower and materials are endless. Following are some examples:

STANDARDIZE RECURRING LAYOUTS: Consider routine field and plant development. Drilling and production equipment installed recurrently lends itself to standardized layouts. So does field equipment in the pipe line. For example, well-engineered standard layouts for setting and connecting gathering pumps as well as lease tanks will save pipe, fittings, and many hours of crew fumbling. Standard setting of field engines will enable a spare to be quickly installed so the regular unit can be properly repaired in clean and well-equipped shops.

APPLY LABOR-SAVING EQUIPMENT: Labor-saving equipment and automatic devices were mentioned before. The manager's part is to approve their use and purchase. But usually the engineer must analyze and prescribe such equipment, and must find application for the devices. This requires keeping abreast of their development and being alert as to their need. The engineer also can assist in development, but he will do well to first make the best use of those available.

TECHNICALLY GUIDE OPERATIONS: Engineers can aid conservation in routine operations. For example, Shell Pipe Line Corporation spends nearly $3 million yearly on public service electric power for electric motors to drive centrifugal pumps. Here minimum use of such power is important. Our engineers held in at least three ways. They decide full-load pressures for the several pumps in a station so, for different throughputs, the pumps can be put in different series combinations for optimum full-load efficiency. They prescribe the trimming of pump impellers to attain this efficiency. And they aid the dispatchers to schedule movements so as to improve load factor.

DESIGN AGAINST CORROSION: Prime opportunities occur in design. Consider corrosion control. This properly starts with the design of structures and equipment so as to minimize corrosion possibilities. Such includes the selection and placement of materials resistant to corrosion — and avoiding the contact of certain dissimilar metals. Underground corrosion can be further minimized by insulating structures from soil and water, and by locating them so as to minimize their susceptiveness to railway and cathodic stray current damage.

DESIGN AGAINST WEAR: Equally important is the use of materials resistant to wear. Most of the 7 million barrels of oil we produce, transport, and refine day after day is caused to flow and flow and flow by the propulsion of moving mechanical parts. Thus the development and use of wear-retardant valves, cylinders and pistons, cases and impellers, and the like, offer a most fertile field for conservation.

CONTRACT WISELY: Engineers can save, too, by careful attention to contract award and performance. For example, the plans and specifications should clearly permit effective competitive bidding. Some contractors may be allowed to bid only to keep them happy. In any event, all bids should be analyzed with the ability of the bidder to perform in mind. If incompetent low bidders are allowed to try, and must later be run off the job, great wastes of time and future plant service may follow. Job inspection should be competent and sympathetic, working with and not against the contractor to save delays and the redoing of poor work.

Conserving "Engineer-Power"

Many other ideas—some better than those just given—can be suggested for use by engineers to save men, equipment, and materials. But while we are conservation-minded, we perhaps should consider certain personal work habits to the end that our industry may better conserve "engineer-power." A foible is a "weak point" or "whimsey." Some engineers'

SAVE MONEY 24 HOURS A DAY with a HOMELITE Carryable GENERATOR

For Operating Tools

With a Homelite Carryable Gasoline Engine Driven Generator, you have instant electric power any place in the field. You have plenty of power to operate electric hand tools . . . not only the standard universal tools but also the newer, faster, more efficient high cycle tools. One man can carry a Homelite and get it in operation any place you need it. Works perfectly, dependably even under the toughest operating conditions.

For Operating Floodlights

Any time night work is necessary in the field, a Homelite is power on the spot . . . power to operate brilliant floodlights to speed work and make it safer for your men. One Homelite Generator will operate several floodlamps, giving you bright, flickerless illumination over a large area. Will operate without trouble in all kinds of weather . from sub-zero to intense heat.

Write for free on-the-job demonstration of Homelite Carryable Generators.

Manufacturers of Homelite Carryable Pumps • Generators • Blowers • Chain Saws

PERFORMANCE · DEPENDABILITY · SERVICE

HOMELITE CORPORATION

1612 RIVERDALE AVENUE • PORT CHESTER, N. Y.

foibles that retard conservation will be discussed.

IMPROVE CONTACTS FOR PLANNING: Reference has been made to the energy lost in duplication of planning between the head office and the divisions. This is a common cause of engineer waste. Insufficient or poorly organized contact usually is the cause. A more serious effect is that planning may be delayed because each office expects the other to do the job.

LOOK FOR BASIC FACTORS: Some engineers seem unable to find the basic factors in their problem and its solution. They "miss the forest for the trees." A simple example was the development 23 years ago by this author of the "ton-mile" formula still used daily in most drilling rigs to measure wire-rope service. Dozens of things can affect the spoilage of drilling cables, and it seemed that all of these should be considered. But when the idea was suddenly grasped that a rope does work in the true physical sense, and that work is merely the product of force (or weight) and distance, a long confusion was cleared and the key formula was found in a few hours.

AVOID PRECONCEIVED IDEAS: Some engineers approach their problems too rigidly. They start with hunches that blind them to the facts. Another simple personal example was development 34 years ago of the formula still used daily at all military and civilian weather stations to determine the ascensional rates of hydrogen-filled meteorological balloons. How to predict this rate was the problem. For years the hunch-players had tried to equate the first power of the lift and the square of the diameter without avail. Five days of the simplest open-minded experimentation in a closed building proved they should use the five-eighths power of the lift and the 1.25 power of the diameter. Not a major discovery, but it enabled 600 meteorologists of the Army Signal Corps overnight to double their service to the artillery and planes in France, and the flying fields at home.

COMPROMISE WITH PERFECTION: In design work, engineers often refuse to compromise with perfection. For example, they design a plant needing a heat exchanger. Many types and sizes of exchangers are commercially available. Yet the perfectionist must take an expert's time to specially design one, and cause the added delay of having it hand-built in the shop. A very few such actions can cause more service loss through delayed plant completion than can be made up in many years by the marginal .00X-percent increase in efficiency to be gained.

MAKE USE OF WHAT'S AT HAND: With present shortages, all engineers perhaps must adapt themselves more and more to the use of what's at hand—at hand perhaps in the scrap- or bone-yard, let alone in the catalog. Our field welders and shop men, who seem able to make almost anything out of leftovers, can give our designers a few lessons if need be. The expedient use of available components is a "must" for conservation during our emergency.

USE THE SALES ENGINEERS: From their ivory towers, certain operators' engineers look upon sales engineers as glad-handing nuisances. And sometimes they are right. In my youth a sage remarked: "Two hybrids have no place in the oil business—the salesman who poses as an engineer, and the engineer who poses as a salesman." But the modern sales engineer is schooled to give the consumer real technical help in the application of his specialty. Also they can give information on what others are thinking and doing. Most of us rely heavily upon him. Others who habitually view him askance are wasting much of their company's time doing needless work, and are perhaps missing many bets.

IMPROVE ESTIMATING HABITS: An unpleasant duty of most engineers is cost estimation. They can reduce their pain and use of time greatly if they will help the accountants to design realistic cost statements, as earlier discussed. Another help in routine work is to get the habit of estimating in terms of assembled units, instead of each time pricing the long lists of flanges, bolts and nipples. One is less likely to underestimate if he visualizes the whole project before starting to cost its elements. My personal peeve is the engineer who underestimates his jobs by forgetting whole essential units, and who remains nonchalant about it.

GET HELP FOR ROUTINE: Many men well-qualified to plan, lay out and direct work, like to donkey through listing and calculating jobs that can be done by non-professionals. Others must do it by force of circumstance. By obtaining junior help, considerable more senior ability will be conserved for other pressing work demanding senior experience and skill.

AVOID OVER-SPECIALIZING: Outside the laboratory, management perhaps is overdoing employment of specialists. We need more men like our hardy forebears who learned a better-than-average smattering of electrical and civil engineering as well as mechanical—and often had some exposure to chemical. Why shouldn't management conserve "engineer-power" by hiring several such abilities under one hat? A fine article addressed to you, suggesting that you should avoid over-specialization, appeared in the August issue of *Mechanical Engineering*, "Take a Broad View of the Scope of Your Profession," by A. P. Adamson of General Electric Company, p. 649, Vol. 73, No. 8.

AVOID THE MUMBLE-JUMBLE: Many technologists will never become engineers until they learn to analyze and present the practical economics of their applied technology. They still are paying for their college defections. They avoided Adam Smith like the plague; thus their economic thinking is in jumble. Now they must plague their associates to make the cost analyses needed to get cash to put their ideas into effect. And those who also avoided English composition usually write as well as talk in technical gobble-de-gook. These fellows are double plagues because they mumble while they jumble!

LEARN TO WRITE BETTER REPORTS: Let's shed a tear for the conscientious one whose boss—or perhaps his boss' boss—in the end always has to milk him for all the facts, and then recompose his report before it has the needed sales appeal. But the mumble-jumble, if unaware of his mental and verbal halitosis, is more to be pitied than censored. In one way or another his best friends should tell him, and teach him how to organize economic as well as technical data, and how to present them in simple terms.

Dear Alma Mater: Give us more engineers who can transcend the technical job of appraising needs and making layouts; yes, and the economic job of estimating capital costs versus operating savings. Give us men who also can do the composition job of wrapping it up in succinct reports that will sell management on the projects.

Proud indeed must be the engineer who can hand his boss reports that are sent on with but short notes of endorsement. His name becomes favorably familiar upstairs, even to the directors. (And that's not bad when salaries are being reviewed.) Here is the engineer who—by saving the energy of his fellow managers—is conserving manpower vital to industry success.

Baash-Ross N

BAASH-ROSS TOOL COMPANY • LOS ANGELES • HOUSTON • OKLAHO

The Newest, Most Compact, Most Advanced BLOCK ASSEMBLY In The Field!

The BAASH-ROSS "DBM" MULTIPLEX BLOCK ASSEMBLY

Loaded with New Features and New Conveniences!

Baash-Ross not only pioneered modern Unitized Block design, but has consistently led in bringing new Block advancements to the oil industry. And the new MULTIPLEX Block is by far the most compact . . . the most convenient . . . the most efficient traveling-block-and-hook assembly yet developed.

New WEIGHT ADJUSTABILITY!

The weight of the MULTIPLEX can be easily adjusted to meet varying operating conditions *without using loose parts or altering the streamlined contour in any way*. Built-in pockets on each side of the MULTIPLEX can be totally or partially filled with lead to increase "falling" speed and boost rig efficiency. Total weight can be increased as much as 20% over the weight of the Blocks themselves —and added weight can easily be removed later, if desired.

Thus, throughout the life of the Blocks, they can be easily made heavier or lighter, as desired, to meet the requirements of each job!

New COMPACTNESS!

The MULTIPLEX is the *shortest* Block and Hook Assembly made. It combines Block, spring-loaded Link Ears and Hook all in *one* compact unit that is not only short—*but also unusually narrow*. We invite you to compare dimensions of the MULTIPLEX with those of *any other* Block and Hook of comparable capacity!

New MULTI-SERVICE HOOK DESIGN!

The spring-loaded MULTIPLEX assembly incorporates *both* a Hook for supporting the swivel, and separate Link Ears equipped with locking arms for supporting the elevator links independent of the Hook. The Hook is equipped with an automatic lock which, when open, helps guide the Hook into the swivel bail. When closed, it cannot open under load —an added safety feature.

New LOW CENTER OF GRAVITY!

In the MULTIPLEX the weight is concentrated unusually low to assure proper balance both while running and at rest. This means steadier Block travel, faster operations, greater working efficiency.

The MULTIPLEX is available in a complete range of sizes and capacities to meet any production or drilling requirement. Write today for complete details . . . or see your nearest Baash-Ross representative!

OTHER OUTSTANDING MULTIPLEX FEATURES

RUGGED BODY CONSTRUCTION carries the entire load on an internal framework of heavy rolled steel plates through which pass the heat-treated center and coupling pins. Cast steel outer shell is completely free of load stresses, assuring maximum strength for heavy-duty service.

B-R

COMPLETELY STREAMLINED design will not catch in rig or equipment. Even bolts, pins and grease fittings are fully recessed.

B-R

DOUBLE-ROW TAPERED BEARINGS on *each* sheave carry full radial loads, as well as any thrust loads caused by fleet angle or spread of lines. Individual grease ducts to each bearing assure positive and uniform lubrication!

B-R

CLOSE-COUPLED SHEAVE DESIGN (no spacer plates—narrow-width bearings) reduces Block width to a minimum. Sheave spacing is same as Baash-Ross "DCO" Crown Block to eliminate fleet angle and drift.

B-R

ONE PIECE GUARD fits close to sheaves to prevent line from jumping the grooves and also to permit threading Block without removing guard. Or where lines are left looped in rig, guard can be quickly removed for reeving.

B-R

SPRING-LOADED HOOK (full 6" spring travel) eliminates shock when picking up loads, reduces wear on bearings and other parts.

B-R

FULL-SWIVELLING HOOK ASSEMBLY rotates freely through complete 360° circle—or can be quickly locked in any of *eight* equi-spaced positions.

B-R

INDIVIDUAL GREASE DUCTS to each bearing are machined into the heat-treated center pin, with recessed grease fittings conveniently located on outside.

FOR *More Information* ON PRODUCTS ADVERTISED

SAVE TIME . . .

By using the free and convenient Reader Service Postcards on opposite page. Circle on the card the identifying key number listed below for each advertisement in this issue on which additional data are desired.

IT'S FAST, CONVENIENT, CERTAIN

A

(A1) A & G Distributors.....340
(A2) Acme Foundry & Machine Co..242
(A3) Aero Service Corp.....285
(A4) Affiliated National Hotels.....238
(A5) The Aldrich Pump Co.....204
(A6) Allis-Chalmers Mfg. Co.....287
(A7) Altens Foundry & Machine Works, Inc. 308
(A8) American Iron & Machine Works Co. .....IV Cover
(A9) American Iron & Machine Works Co. 125
(A10) American Manufacturing Co. of Texas..... 6
(A11) American Sand-Banum Co.....162
(A12) Associated Oil Field Rentals..316
(B1) Axelson Manufacturing Co.....171

B

(B2) B & W Incorporated.....298
(B3) Baash-Ross Tool Co..... 69
(B4) The Baker Mfg. Co.....311
(B5) Baker Oil Tools, Inc..... 38
(B6) Baker Oil Tools, Inc.....260-261
(B7) Bank of Montreal.....280
(B8) The Bank of Nova Scotia.....282
(B9) Barold Sales Division National Lead Co.....248
(B10) Baroid Sales Division National Lead Co.....III Cover
(B11) Wm. M. Barret, Inc.....340
(B12) The J. R. Beaird Co.....227
(C1) Beaumont Well Works Co.....321
(C2) Beaver Pipe Tools, Inc.....245
(C3) Bell Rubber Co.....210
(C4) Bethlehem Steel Co..... 10
(C5) Bethlehem Steel Co..... 47
(C6) Bethlehem Steel Co.....159
(C7) Bettis Corp. 309
(C8) Black, Sivalls & Bryson, Inc. 180-181
(C9) Black, Sivalls & Bryson, Inc...191
(C10) The Bovaird Supply Co.....168
(C11) S. R. Bowen Co.....317
(C12) The Brewster Co..... 91
(D1) Bucyrus-Erie Co. 25
(D2) Byron Jackson Co..... 99
(D3) Byron Jackson Co.....309

C

(D4) Cable & Staples.....210
(D5) Cameron Iron Works, Inc.....114
(D6) Canadian Allis-Chalmers, Ltd...245
(D7) Canadian Allis-Chalmers, Ltd...305
(D8) Canadian Allis-Chalmers, Ltd...313
(D9) The Canadian Bank of Commerce 293
(D10) Cardwell Manufacturing Co...58-59
(D11) Catawissa Valve & Fittings Co..335
(D12) Caterpillar Tractor Co..... 11
(E1) The Cavins Co.....305
(E2) Century Geophysical Corp..... 95
(E3) Chicago & Southern Air Lines.327
(E4) Chiksan Co. 324
(E5) Christensen Diamond Products Co. 160
(E6) Clark Bros. Co.....236-237
(E7) Columbus McKinnon Chain Corp. 152
(E8) Continental Oil Co..... 14
(E9) Fred E. Cooper, Inc.....275
(E10) The Cooper-Bessemer Corp.....299
(E11) Core Laboratories, Inc.....107
(E12) Crane Co. 41

D

(F1) Detroit Diesel Engine Division General Motors Corp.....101
(F2) The Dia-Log Co.....161
(F3) Dowell Incorporated 36
(F4) Drilling & Service, Inc.....153
(F5) E. I. du Pont de Nemours & Co. 128
(F6) E. I. du Pont de Nemours & Co. 198-199

E

(F7) The Eagle-Picher Co.....334
(F8) Eastman Oil Well Survey Co...141
(F9) E. H. Edwards Co.....165
(F10) Eisenwerk Wuelfel 175
(F11) Empire Trust Co.....106
(F12) Emsco Derrick & Equipment Co. 131
(G1) Emsco Derrick & Equipment Co. 132

F

(G2) Fairbanks, Morse & Co.....209
(B3) The First National Bank & Trust Co. 333
(G4) First National Bank in Dallas.319
(G5) Fluid Packed Pump Co....185-186
(G6) Fuller Co. 193

G

(G7) Gaso Pump & Burner Mfg. Co..221
(G8) General Geophysical Co.....79
(G9) The Geolograph Co.....313
(G10) Geophysical Service, Inc..... 85
(G11) Goodall Rubber Co.....163
(G12) The B. F. Goodrich Co..... 9
(H1) The Goodyear Tire & Rubber Co. 5
(H2) H. P. Gott Manufacturing Co...340
(H3) Grant Oil Tool Co.....336
(H4) The Guiberson Corp.....109
(H5) Gulf Oil Corp..... 22

H

(H6) Halliburton Oil Well Cementing Co. 44
(H7) Halliburton Oil Well Cementing Co. 80
(H8) Halliburton Oil Well Cementing Co. 157
(H9) Harbison-Fischer Mfg. Co.....217
(H10) Harbison-Fischer Mfg. Co.....219
(H11) Harrisburg Steel Corp.....244
(H12) Herb J. Hawthorne, Inc..... 87
(J1) Hector Machine Co.....344
(J2) Hercules Tool Co.....206
(J3) Hetz Auction Sales.....313
(J4) Hinderliter Tool Company Div H. K. Porter Co.....343
(J5) Homelite Corp. 67
(J6) Houston Laboratories 344
(J7) Houston Ready-Cut House Co....220
(J8) J. M. Huber Corp.....338
(J9) Hughes Tool Co.....I Cover
(J10) Hughes Tool Co.....247
(J11) Hutchison Manufacturing Co...164

I

(J12) Imperial Bank of Canada.....310
(K1) Independent Exploration Co..... 93
(K2) Inflico Incorporated 201
(K3) International Harvester Co..... 4
(K4) International Harvester Co.....259
(K5) The International Nickel Co..... 29

J

(K6) Jefferson Union Co.....218
(K7) Jensen Brothers Manufacturing Co. 214
(K8) M. O. Johnston Oil Field Service Corp. 135
(K9) Johnston Oil Field Service Corp. 15
(K10) The S. M. Jones Co.....207
(K11) Jones & Laughlin Supply Co... 17
(K12) Joy Manufacturing Co..... 89
(L1) Justrite Manufacturing Co.....321

K

(L2) Kaiser Steel Corp.....243
(L3) Kelley Manufacturing Co.....330
(L4) Kern Directional Drilling Corp..154
(L5) Kerotest Manufacturing Co.....315
(L6) Kimray, Inc. 318
(L7) King Oil Tools.....112
(L8) Kinzbach Tool Co.....332
(L9) Kobe, Inc. 197

L

(L10) L & H Machine Works.....154
(L11) L & H Machine Works.....330
(L12) Lane-Wells Company 33
(M1) Lane-Wells Company 65
(M2) Lane-Wells Company 179
(M3) Lane-Wells Company 255
(M4) Lane-Wells Company 342
(M5) The Layne and Bowler Co..... 12
(M6) LeBus International Engineers, Ltd. 276-277
(M7) Levingston Shipbuilding Co.....325
(M8) Link-Belt Co. 3
(M9) Lone Star Cement Corp....II Cover
(M10) Lone Star Tool Co.....158
(M11) Lucey Export Corp.....257
(M12) Lufkin Foundry & Machine Co..303

M

(N1) Mack Trucks, Inc.....307
(N2) Magnet Cove Barium Corp.....145
(N3) Maloney-Crawford Tank & Mfg. Co. 21
(N4) Jas. P. Marsh Corp..... 77
(N5) Martin-Decker Corp. 322
(N6) McCullough Tool Co.....341
(N7) McGowan Pump Co.....326
(N8) McKissick Products Corp..... 18
(N9) Mid-Continent Supply Co.....235
(N10) Mid-Continent Supply Co.....342
(P1) Miller Sand Pump Co.....218
(P2) Mission Manufacturing Co.....149
(P3) Lee C. Moore Corp.....139
(P4) Morse Chain Co.....297

N

(P5) The National Supply Co..... 54
(P6) National Tank Co.....173
(P7) National Tube Co.....155
(P8) National Tube Co.....294
(P9) Nelson Co. 240
(P10) Nordstrom Valve Division Rockwell Manufacturing Co..... 27
(P11) W. C. Norris, Manufacturer, Inc. 49

(P12) Oil Center Tool Co.....211
(Q1) Oil Well Manufacturing Corp....102
(Q2) Oil Well Supply Co..... 8
(Q3) Orbit Valve Co.....273
(Q4) Otis Pressure Control, Inc.....213

P

(Q5) Pacific Coast Borax Co.....302
(Q6) Pacific Pumps, Inc.....331
(Q7) Page Oil Tools, Inc.....208
(Q8) Parelex Corp. 210
(Q9) Parkersburg Machine Co.....344
(Q10) The Parkersburg Rig & Reel Co. 28
(Q11) Pelican Well Tool & Supply Co. 325
(Q12) Perforating Guns of Canada, Ltd. 288
(R1) Petroleum Distributing Co.....314
(R2) Petroleum Electric Power Association 233
(R3) Petroleum Specialty Co.....215
(R4) Piper Aircraft Corp..... 63
(R5) Pittsburgh Coke & Chemical Co. 320
(R6) H. C. Price Co.....245

R

(R7) Rector Well Equipment Co.....195
(R8) Rectorseal 210
(R9) Reda Pump Co.....220
(R10) Reed Roller Bit Co.....113
(R11) Reed Roller Bit Co.....143
(R12) Republic Exploration Co.....104
(S1) Republic Steel Corp..... 19
(S2) Republic Steel Corp.....225
(S3) The Ridge Tool Co.....323
(S4) Rockwell Manufacturing Co..... 13
(S5) John A. Roebling's Sons Co..... 31
(S6) The Royal Bank of Canada.....306

S

(S7) S & H Tool & Supply Co.....305
(S8) Santa Fe Railway.....337
(S9) Schlumberger Well Surveying Corp. 203
(S10) The Second National Bank of Houston 16
(S11) Seismograph Service Corp..... 34
(S12) Shaffer Tool Works..... 24
(T1) A. O. Smith Corp.....271
(T2) Southern Engine & Pump Co...321
(T3) Southern Mill & Manufacturing Co. 312
(T4) Spang & Co.....110
(T5) Spang-Chalfant Division The National Supply Co.....52-53
(T6) Standard Oil Company of California 20
(T7) Standco Brake Lining Co.....317 and 344
(T8) Stitt Ignition Co.....166

T

(T9) Templeton, Kenly & Co.....166
(T10) Texas Employers Insurance Assoc. 30
(T11) Texas Flange Co.....108
(T12) The Thermoid Co..... 23
(U1) Thornhill-Craver Co. 183
(U2) The Torrington Co.....147
(U3) Trans-Texas Airways 344
(U4) Tretolite Co. 167
(U5) The Tripplehorn Co.....216
(U6) Trojan Construction Co.....242
(U7) Twin Disc Clutch Co.....329

U

(U8) Union Wire Rope Corp.....96-97
(U9) United States Steel Export Co..301

V

(U10) Varner Co. 304
(U11) Victaulic Company of America. 32
(U12) Visco Products Co..... 7

W

(V1) W-K-M Company 189
(V2) Waukesha Motor Co..... 75
(V3) Waukesha Sales & Service Co...137
(V4) Webb Wilson Oil Tools.....269
(V5) Welex Jet Services, Inc.....123
(V6) Well Surveys, Inc.....105
(V7) Western Geophysical Co.....103
(V8) Westinghouse Air Brake Co.....317
(V9) Wheeling Machine Products Co..240
(V10) Whitney Chain Co..... 26
(V11) Wichita Tool Repair Co.....166
(V12) Wickwire Spencer Steel Division The Colorado Fuel & Iron Corp...150
(X1) Williams Brothers 246
(X2) Wilson Manufacturing Co...118-119
(X3) Wilson Supply Co.....111
(X4) Wilson Supply Co.....291
(X5) Wood, Gundy & Company.....309

Y

(X6) The Youngstown Sheet & Tube Co. 222

New Catalogs AND EQUIPMENT LITERATURE

For copies of the catalogs and new equipment literature listed, use one of the convenient Reader Service Postcards on this page. Just circle the number on the card corresponding to the number of the item in which you are interested.

Temperature Chart

Acme Fishing Tool Company's engineers have prepared a Bit (field) Dressing Heat-Color Chart to aid cable tool drillers. Color plates for the chart, a graphic presentation of the relation between heat colors and temperatures, were prepared under the supervision of Crucible Steel Company of America.

Circle No. 1 on Postcard

Jacks

A complete line of lifting and lowering jacks for oil field service is described in a new four-page bulletin published by The Duff-Norton Manufacturing Company.

Circle No. 2 on Postcard

Rotary Pumps

A four-page bulletin on a new heavy duty, vane type rotary pump made by Worthington Pump and Machinery Corporation describes the six models of the pump in eight sizes. They include pipe openings from 2 to 12 suction inches, and 2 to 10 discharge inches. The range of nominal ratings includes capacities from 20 to 1000 gpm and speeds from 850 to 210 rpm.

Circle No. 3 on Postcard

Low Temperature Extraction

The October issue of National Tank Company's "Tank Topics" contains two reprints from oil publications on low temperature extraction. One of the papers, "First Offshore Gas Condensate Production," by George R. Olsen, first appeared in the October, 1951, issue of World Oil.

Circle No. 4 on Postcard

Check Valves

The Williams Gauge Company has issued a four-page bulletin describing Williams-Hager silent check valves for preventing water hammer. The bulletin includes technical data, cutaway versions of two types of valves and a series of installation photographs.

Circle No. 5 on Postcard

USE THESE CARDS
To Get
COPIES OF CATALOGS
And for More Information on
NEW EQUIPMENT ADVERTISED PRODUCTS

EASY TO USE . . . FREE

Circle on one of the cards at right the identifying numbers of each new equipment and catalog item or advertised product on which you want more information. Print your name and address plainly. Tear out and mail card. That's all there is to it. No postage is required if card is mailed in U.S.A. your request will be forwarded promptly to the company concerned, and the reply will come direct to you.

Postage Will be Paid by Gulf Publishing Company

No Postage Stamp Necessary if Mailed in the United States

BUSINESS REPLY CARD

First Class Permit No. 7 (Sec. 34.9, P. L. & R.) Houston, Texas

WORLD OIL

BOX 2608

HOUSTON 1, TEXAS, U. S. A.

WORLD OIL Reader Service POSTCARD — **December, 1951, Issue***

EDITORIAL ITEMS—Circle item numbers on which more information desired:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75

ADVERTISEMENTS—Circle key number of ad for more product information:

A1	B1	C1	D1	E1	F1	G1	H1	J1	K1	L1	M1	N1	P1	Q1	R1	S1	T1	U1	V1	X1
A2	B2	C2	D2	E2	F2	G2	H2	J2	K2	L2	M2	N2	P2	Q2	R2	S2	T2	U2	V2	X2
A3	B3	C3	D3	E3	F3	G3	H3	J3	K3	L3	M3	N3	P3	Q3	R3	S3	T3	U3	V3	X3
A4	B4	C4	D4	E4	F4	G4	H4	J4	K4	L4	M4	N4	P4	Q4	R4	S4	T4	U4	V4	X4
A5	B5	C5	D5	E5	F5	G5	H5	J5	K5	L5	M5	N5	P5	Q5	R5	S5	T5	U5	V5	X5
A6	B6	C6	D6	E6	F6	G6	H6	J6	K6	L6	M6	N6	P6	Q6	R6	S6	T6	U6	V6	X6
A7	B7	C7	D7	E7	F7	G7	H7	J7	K7	L7	M7	N7	P7	Q7	R7	S7	T7	U7	V7	X7
A8	B8	C8	D8	E8	F8	G8	H8	J8	K8	L8	M8	N8	P8	Q8	R8	S8	T8	U8	V8	X8
A9	B9	C9	D9	E9	F9	G9	H9	J9	K9	L9	M9	N9	P9	Q9	R9	S9	T9	U9	V9	X9
A10	B10	C10	D10	E10	F10	G10	H10	J10	K10	L10	M10	N10	P10	Q10	R10	S10	T10	U10	V10	X10
A11	B11	C11	D11	E11	F11	G11	H11	J11	K11	L11	M11	N11	P11	Q11	R11	S11	T11	U11	V11	X11
A12	B12	C12	D12	E12	F12	G12	H12	J12	K12	L12	M12	N12	P12	Q12	R12	S12	T12	U12	V12	X12

Name (Please Print)_____

Company_____ Position_____

Address_____

MAIL IT NOW . . . *CARD EXPIRES FEBRUARY 29, 1952

New Catalogs AND EQUIPMENT LITERATURE

Use one of the free and convenient Reader Service Postcards on this page to request copies of the catalogs in which you are interested.

Tanks and Separators

Replacement price sheets on nine National Tank Company product classifications have been issued. They concern vertical low pressure separators; IC-A and IC-P treaters; A-A and A-P treaters; IW-A and IW-P treaters; free water knockouts, baffle tanks, and wash tanks; National closed type water disposal system; bolted tanks; bolted tank parts; and Armco casing and Titeline couplings.

Circle No. 6 on Postcard

Deep Drilling Rig

A 16-page bulletin released by The National Supply Company describes its Ideal Type 130 Consolidated drilling rig incorporating a 1300-input-horsepower drawworks. The text describes the rig's air actuated controls; air operated clutches, brakes and catheads; and two-section construction.

Circle No. 7 on Postcard

Hydraulic Control

A positive remote control manufactured by Superdraulic Corporation is described in a new two-color bulletin. The hydraulic control is engineered for remote operations of controls, clutches, transmissions, valves, throttles, equalizers, governors, etc.

Circle No. 8 on Postcard

•

Packers

Catalog sections on two packers made by The Guiberson Corporation are available. Described are Type KVL 30 packer with automatic latch; and the new Type "WF" hold down packer with automatic latch.

Circle No. 9 on Postcard

•

Oil Base Muds

A four-page folder illustrating facilities of the Compton, Calif., plant has been issued by Oil Base, Inc., manufacturer of Black Magic and conditioners for oil base drilling fluids.

Circle No. 10 on Postcard

•

Mud Thinner

"Maccotan Improved Mud Thinner," an eight-page bulletin published by Macco Corporation, describes a chemical thinner for clay-water muds or clay-water-oil emulsion muds.

Circle No. 11 on Postcard

•

Welding Equipment

Victor Equipment Company has published a new apparatus catalog which describes its complete line of welding equipment.

Circle No. 12 on Postcard

•

More Literature News on Page 76

WORLD OIL Reader Service POSTCARD **December, 1951, Issue***

EDITORIAL ITEMS—Circle item numbers on which more information desired:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75

ADVERTISEMENTS—Circle key number of ad for more product information:

A1	B1	C1	D1	E1	F1	G1	H1	J1	K1	L1	M1	N1	P1	Q1	R1	S1	T1	U1	V1	X1
A2	B2	C2	D2	E2	F2	G2	H2	J2	K2	L2	M2	N2	P2	Q2	R2	S2	T2	U2	V2	X2
A3	B3	C3	D3	E3	F3	G3	H3	J3	K3	L3	M3	N3	P3	Q3	R3	S3	T3	U3	V3	X3
A4	B4	C4	D4	E4	F4	G4	H4	J4	K4	L4	M4	N4	P4	Q4	R4	S4	T4	U4	V4	X4
A5	B5	C5	D5	E5	F5	G5	H5	J5	K5	L5	M5	N5	P5	Q5	R5	S5	T5	U5	V5	X5
A6	B6	C6	D6	E6	F6	G6	H6	J6	K6	L6	M6	N6	P6	Q6	R6	S6	T6	U6	V6	X6
A7	B7	C7	D7	E7	F7	G7	H7	J7	K7	L7	M7	N7	P7	Q7	R7	S7	T7	U7	V7	X7
A8	B8	C8	D8	E8	F8	G8	H8	J8	K8	L8	M8	N8	P8	Q8	R8	S8	T8	U8	V8	X8
A9	B9	C9	D9	E9	F9	G9	H9	J9	K9	L9	M9	N9	P9	Q9	R9	S9	T9	U9	V9	X9
A10	B10	C10	D10	E10	F10	G10	H10	J10	K10	L10	M10	N10	P10	Q10	R10	S10	T10	U10	V10	X10
A11	B11	C11	D11	E11	F11	G11	H11	J11	K11	L11	M11	N11	P11	Q11	R11	S11	T11	U11	V11	X11
A12	B12	C12	D12	E12	F12	G12	H12	J12	K12	L12	M12	N12	P12	Q12	R12	S12	T12	U12	V12	X12

Name (Please Print)_____

Company_____ Position_____

Address_____

MAIL IT NOW . . . *CARD EXPIRES FEBRUARY 29, 1952

Postage Will be Paid by Gulf Publishing Company

No Postage Stamp Necessary if Mailed in the United States

BUSINESS REPLY CARD

First Class Permit No. 7 (Sec. 34.9, P. L. & R.) Houston, Texas

WORLD OIL

BOX 2608

HOUSTON 1, TEXAS, U. S. A.

USE THESE CARDS To Get COPIES OF CATALOGS And for More Information on NEW EQUIPMENT ADVERTISED PRODUCTS

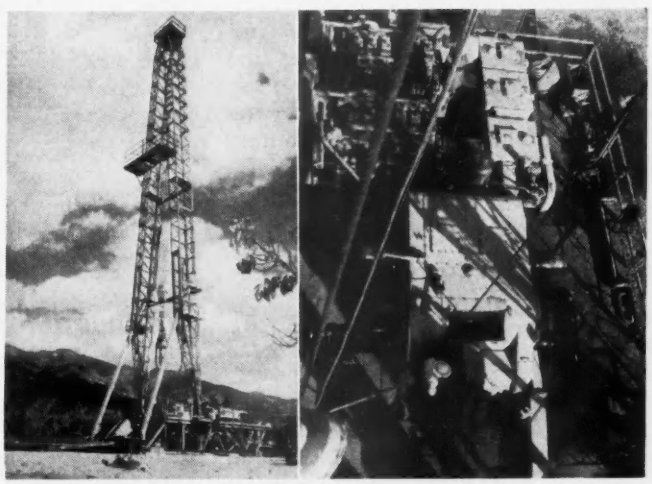
NEW AND IMPROVED EQUIPMENT

SUPPLEMENTING COMPOSITE CATALOG

KEEP INFORMED by requesting additional information on new equipment and services described on this and following pages. SAVE TIME by using one of the free and convenient Reader Service Postcards on opposite page. Circle number on card corresponding to the number listed at the end of each new equipment item on which you desire additional information.

Medium Depth Rig

This item supplements Bethlehem Steel Company data on pages 671-672 of Composite Catalog, 18th Edition.



A new medium depth drawworks, the M-58 made by Bethlehem Pacific Coast Steel Corporation, is easy to move and provides wide latitude in the choice of engines, engine combinations and pump drives. Shown at left is Acme Drilling Company's M-58 drawworks and compound assembled on an Ideco 133-foot "Full-View" derrick and a nine-foot substructure. At right is an overhead view of the drawworks and compound which illustrates the eight-foot widths of the drawworks structure, and easy acces to drilling controls and sectional compound cases mounted on engine skids. The rig is powered with two 375-horsepower LRO Waukesha engines driving through a sectionalized compound and chain transmission. Bethlehem air-friction clutches are used as the drawworks drive clutch, rotary clutch and in the high and low speed drive at the main drum. Bethlehem Gear-Spline clutches are used in transmission and for engine compounding. The 46-inch brakes are cooled by an enclosed circulating water system. Dowell pin positioners are used for alignment.

Circle No. 13 on Postcard

Controller

This item supplements Taylor Instrument Companies data on page 4797 of Composite Catalog, 18th Edition.

A new, non-indicating force-balance controller with only one knob adjustment for two control responses has been introduced by Taylor Instrument Companies. The Transet Bi-Act Controller, designed for applications where it is desirable to transmit the measured variable to a remote location, is particularly adaptable to flow, liquid level or pressure applications requiring fast reset rates and broad throttling bands, or applications where derivative action is not essential.

Circle No. 14 on Postcard

Rotary Pump

This item supplements Worthington Pump and Machinery Corporation data on pages 5201-5220 of Composite Catalog, 18th Edition.

A heavy duty, vane type rotary pump has been added to the line of rotary pumps made by Worthington Pump and Machinery Corporation. All models are positive displacement, sliding vane type, in which the pressure of the liquid being pumped maintains contact of the vanes against the liner. The pumps are available in both internal and external bearing design. They have built-in relief valve, and are available in either standard fitted, bronze fitted or in all bronze construction.

Circle No. 15 on Postcard

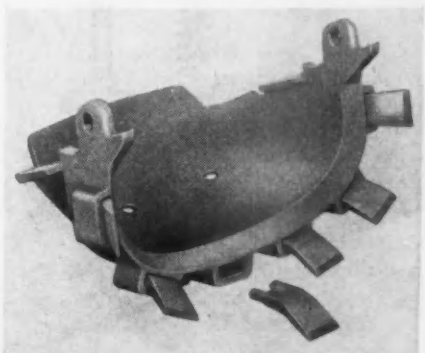
•

Bucket Tooth

This item supplements Koehring Company data on page 2749 of Composite Catalog, 18th Edition.

Parsons Company, a subsidiary of Koehring Company, is now using Tap-In bucket teeth as standard equipment on all its Trenchliners. The new self-locking tooth eliminates the need for bolting or crimping edges to hold it in position. A taper locks the tooth firmly in place either on buckets or sidecutter bars. Tooth holders are integrally cast with the bucket lip for positive tooth support.

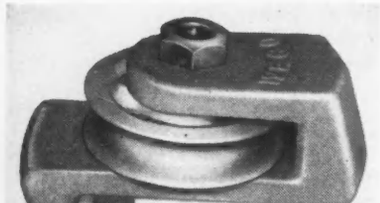
Circle No. 16 on Postcard



NEW EQUIPMENT

SUPPLEMENTING COMPOSITE CATALOG

To obtain additional information use one of the convenient Reader Service Postcards. Circle number on card corresponding to number listed at the end of each new equipment item on which more information is wanted.



Side Line Block

This item supplements Well Equipment Manufacturing Corporation data on pages 5037-5064 of Composite Catalog, 18th Edition.

A block which hooks onto the back corner of a truck bed has been developed by Well Equipment Manufacturing Corporation. It permits pulling in or shifting a load at right angles to the truck without looping the line under the corner of the truck bed or resorting to makeshift methods of attaching a snatch block. The side line block lies flat on the bed of the truck, with the hook or tongue hooked into slots cut into the side of the truck frame. It can be used on either side of the truck.

Circle No. 17 on Postcard

•

Water Control Valve

This item supplements A-1 Bit and Tool Company data on pages 101-124 of Composite Catalog, 18th Edition.

The A-1 Gardner Water-Control Valve, available from A-1 Bit and Tool Company, cuts off the water to the mud tank or mud pit when the mud pressure drops off, as in coring or making connections. The water line to the tank or pit and the mud line from the tank or pit are connected in parallel. Mud pressure acting on a piston overcomes counteracting spring tension, keeping the mud line and water line open while the pressure is up. When pressure drops off, spring tension automatically closes both mud line and water line.

Circle No. 18 on Postcard

•

Oil Base Mud

This item supplements Oil Base, Inc., data on pages 3739-3746 of Composite Catalog, 18th Edition.

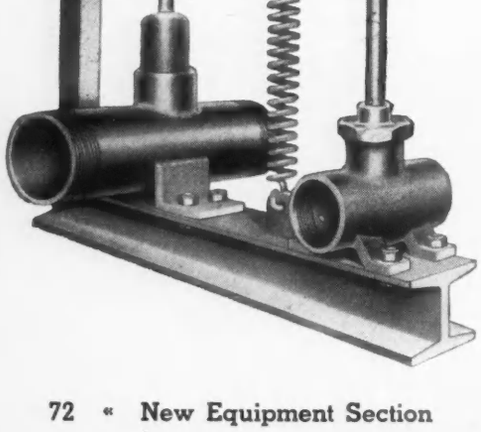
Oil Base, Inc., has introduced Econo Magic, a new oil base material that is mixed with crude for use in completing shallow, cold wells, for workovers, and for redrilling into depleted oil sands. It is light weight, and has good plastering properties. It deposits a paper-thin mud cake and is especially adaptable when lost circulation in oil sands is a problem. It will not lose water with the filtrate under normal temperatures, but high temperatures and conditions requiring excellent weight material suspension ability are to be avoided.

Circle No. 19 on Postcard

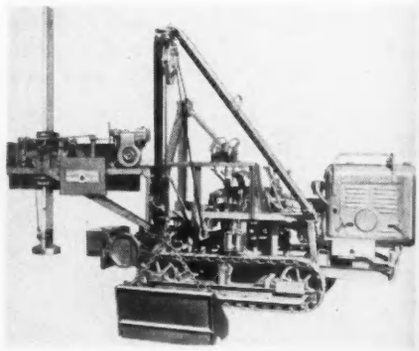
•

Tamper-Backfiller

This item supplements The Cleveland Trencher Company data on page 1224 of Composite Catalog, 18th Edition.



The Cleveland Trencher Company's Model 80 is a one-man-operated machine that tamps, backfills, lays pipe, unloads and handles pipe, sheathing, etc., and does all types of light crane work. The machine is mounted on a crawler having 24 separate travel speeds, ranging from one foot per minute up to 2⅛ miles per hour. The tamper delivers a 380-foot-pound blow 45 times a minute, and operates while traveling either along the side of the trench or straddling it. The backfiller is a conventional dragline type with telescopic boom. Without extra counterweights, it will lift a weight of 6000 pounds.



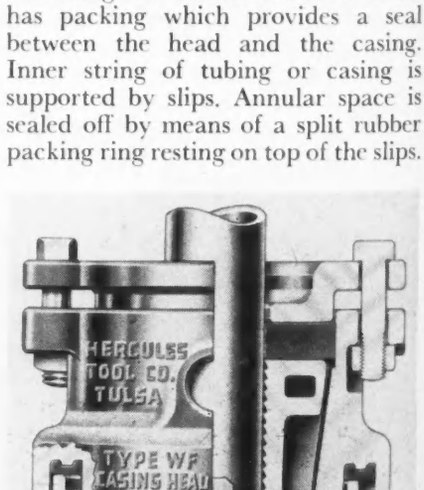
Circle No. 20 on Postcard

•

Wellhead

This item supplements Hercules Tool Company data on pages 2247-2249 of Composite Catalog, 18th Edition.

Type "WF" (water flooding) tubing and casing head, manufactured by Hercules Tool Company, is a new product especially adaptable to water-flooding projects. It can also be used on other wells and is capable of supporting an inner string of pipe weighing up to 100,000 pounds. A groove extending into the bottom of the head has packing which provides a seal between the head and the casing. Inner string of tubing or casing is supported by slips. Annular space is sealed off by means of a split rubber packing ring resting on top of the slips.



Circle No. 21 on Postcard

OTHER NEW AND IMPROVED EQUIPMENT

KEEP INFORMED by requesting additional information on new equipment and services described on this and following pages. SAVE TIME by using one of the free and convenient Reader Service Postcards in this issue. Circle number on card corresponding to the number listed at the end of each new equipment item on which you desire additional information.

Explosion Preventer

Pictured is Atlas Exploration Company's field demonstration truck, equipped with various types of gas detecting units for use in preventing explosions in industry and a calibrating device by which gas detectors can be calibrated under actual working conditions. Instruments include a portable model Probetector, a light-

weight, portable unit commonly used for determining explosive possibilities of gases in any location by sampling gas with a special probe-head; an alarm model; a model for detecting hydrocarbons on drilling rigs for use of geologists and safety engineers; a model for testing drilling mud samples and a model for detecting gases on boats.

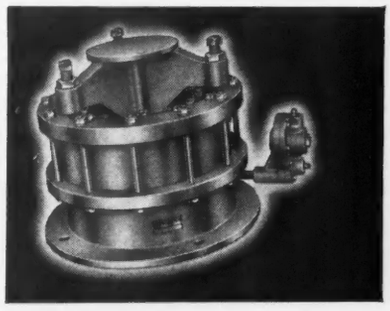
Circle No. 22 on Postcard

•

Emulsifier

The Drilling Fluid division of Macco Corporation offers a new material which provides a low cost emulsifier or emulsion mud resistant to contamination. It has low filtrate loss, and good lubricating qualities. Macco Iso-Mull is a dry non-hydroscopic powdered organic compound which will, with the addition of caustic soda and oil, emulsify any conventional clay-water mud, the manufacturer claims. It may be used with or without lime and at low pH as well as high pH.

Circle No. 23 on Postcard



Weight Transmitter

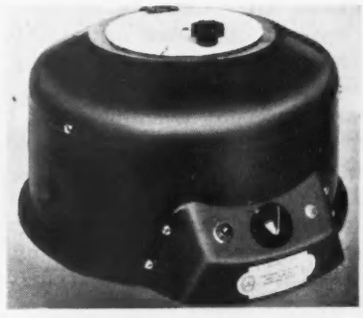
The "air scale" Weight Transmitter, a completely pneumatic scale for either batch weighing or continuous process control has been introduced by Fluid Controls Company, Inc. The device converts a variable force or weight into an easily measured pneumatic signal. Operating on the force-balance principle, the weight transmitter indicates, records, or controls weight or force through standard instruments in the manner commonly applied to temperature, flow, pressure, and level problems.

Circle No. 24 on Postcard

•

Centrifuge Machine

W. L. Walker Company has developed a compact centrifuge machine for measurement of base sediment and water content. The machine has a combined rheostat and switch with safety pilot light. Speeds are adjustable up to 2450 revolutions per minute. The all-aluminum centrifuge, which is designed to operate off a car battery, requires only six volts and 5½ amps. The tube head is numbered to aid identification of samples.



Circle No. 25 on Postcard

Back-Ripper

Preco Incorporated now has Back-Rippers, which mount on the back of bulldozer moldboards and rip only when the tractor backs up, available for angling blade bulldozers. The four Back-Ripper housings are welded to the under side of the "C" frame on angling blade bulldozers, permitting their use irrespective of the angle

of the blade itself. The teeth float on top of the ground when the tractor moves forward, and automatically dig and rip when the tractor backs up.

Circle No. 26 on Postcard

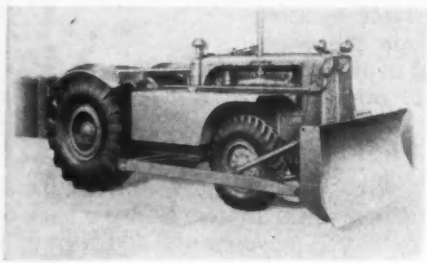
•

Safety Clamp

A polish rod safety clamp to protect the hands of the pumper while changing stuffing box rubbers has been developed by Meynig Bros. Made from spring steel and weighing only seven ounces, it can be clamped with one hand while the pumper holds the packing gland up with the other hand. It will not scar or damage the polish rod and is designed to stand many times the weight it is required to hold, the manufacturer claims.

Circle No. 27 on Postcard

To obtain additional information use one of the convenient Reader Service Postcards. Circle number on card corresponding to number listed at the end of each new equipment item on which more information is wanted.



Bulldozer

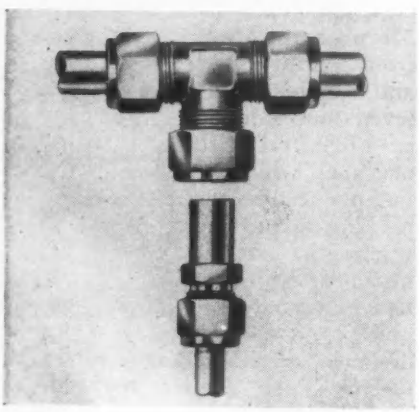
Caterpillar Tractor Company makes the No. 10S bulldozer, a straight blade machine for use with the DW10 Tractor. The bulldozer includes a blade, push arms and braces, hitch, sheave support and heavy-duty radiator guard, combination cable and sheave group. Trunnions are included in the weight box and frame group. The group provides support for the trunnions at each side of the tractor and includes a heavy box at the rear of the tracto to accommodate four counterweights.

Circle No. 28 on Postcard

•

Reducer Fitting

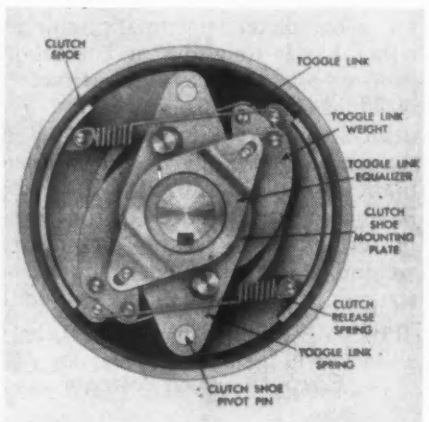
The new Swagelok reducer fitting made by Crawford Fitting Company permits different sizes of tubing to be joined easily. It consists of a body, two ferrules and a nut. The two ferrules plus the threaded chuck inside the Swagelok nut clinch tight around the tubing wall and provide a leakproof seal. Illustrated is a half-inch Swagelok all tube tee and a ⅜-inch Swagelok reducer. The fittings are available in brass, aluminum, steel, stainless steel and Monel, with sizes ranging from ⅛- to ⅞-inch O.D.



Circle No. 29 on Postcard

Automatic Clutch

A new type automatic clutch in Salsbury Corporation's Tog-o-loc series is designed for operation on any 7 to 15 horsepower engine, with 1⅛-, 1 7/16-, or 1½-inch standard shaft. The clutch has normal engagement speed of 11 to 1200 revolutions per minute, but disengages at as low as 800 rpm. The wide differential is made possible by the Tog-o-loc mechanism, a linkage connecting heel and toe of the two opposing shoes. The toggle lock is centrifugally actuated and equalized on both the "pickup" and "release" of the load. All models have hub bores mating with standard en-



gine shafts, without necessity for any extension, grinding, boring or slotting. They are available either with standard size pulleys with single and double grooves or with plain hubs onto which special service pulleys may be mounted.

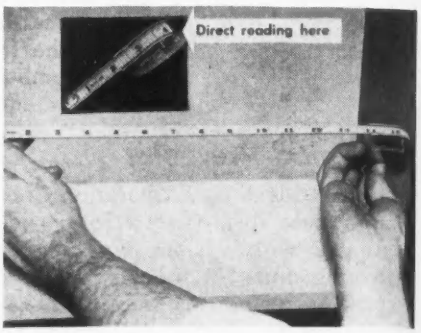
Circle No. 30 on Postcard

•

Anti-Rust Paint

Rust-Cure, a new anti-rust paint made by The Monroe Company, can be applied over rust without wire-brushing, scraping or sandblasting. Available in black, aluminum and clear, the paint is suitable for both interior and exterior use on either old or new metal. Upon application, it is said to penetrate through any existent rust layer and seal the surface against further rust action. It is compounded for brush application, and may be thinned for spray use.

Circle No. 31 on Postcard



Steel Rule

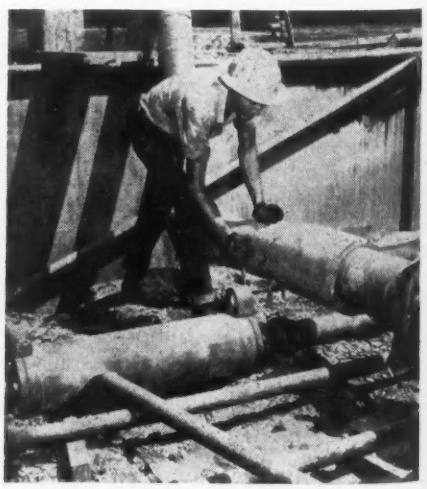
Master Rule Company's multi-purpose Streamline steel measuring tape permits taking inside measurements in hard-to-reach or poorly illuminated places. A locking lever positively retains the measurement taken in a poorly illuminated area, so that the measurement can be read when the rule is moved into the light.

Circle No. 32 on Postcard

•

Desurger

Damaging pulsations and shock in oil pipe lines caused by pumping action or by the closing of a valve in drilling operations are virtually eliminated by use of the Fluidynamic Desurger, made by the Valve Engineering & Development Company. Utilizing Hycar American rubber, the desurger accumulates the shock pressure waves, lops off their energy, and discharges them back into the line without damaging pressures, the manufacturer claims.



Circle No. 33 on Postcard

You can believe in
THIS SIGN

...it identifies your Waukesha Distributor

How well . . . and how long . . . Waukesha Engines and Power Units perform for the user of a truck, tractor, air compressor, shovel, oil rig, or any other power machinery . . . is of prime importance to the Waukesha Motor Company . . .

And the link between the two—the Waukesha Distributor, is of equal importance.

For your convenience the Waukesha Distributor in your locality has a full stock of Waukesha engineered parts. And an assortment of complete Waukesha Power Units for quick delivery . . .

Experienced mechanics, too—ready to give your Waukesha Engines periodic inspection and tune-up . . . or to rebuild your equipment when needed. Trained engine-specialists perform every service operation by factory-approved methods, and to Waukesha precision standards. The mechanical staff will be glad to give you practical technical advice on any phase of the use and care of Waukesha power plants.

Your Waukesha Distributor is a part of a select, nationwide organization of engineers and service men of specialized experience and the highest reputation. He's a good man to know . . . and you'll like him, too. Look for the sign—stop in and see him. 146

WAUKESHA MOTOR COMPANY, WAUKESHA, WIS.
NEW YORK • TULSA • LOS ANGELES

NEW LITERATURE

Copies may be obtained easily and without cost by using Reader Service Postcard. Just circle on the card the number at the end of each item in which you are interested. The Postcards are opposite page 71.

Casing

A new 16-page bulletin deals with 6- to 24-inch casing made by Armco Drainage & Metal Products, Inc. The book tells how the oil and gas well casing is made, and gives dimensions and properties in tabular form.

Circle No. 34 on Postcard

•

Conveyor Belt

Ray-Man "F" conveyor belt is described in a bulletin released by Raybestos-Manhattan, Inc. The general purpose heavy duty belt is designed for application where there is danger of tearing or puncture, where small pulleys are used, where flexibility is required, and where thick, narrow belts are required.

Circle No. 35 on Postcard

•

Motor Driven Compressors

Balanced/Opposed motor driven compressors manufactured by Clark Bros. Company, Inc., are dealt with in a 50-page multi-colored catalog. Specifications for the complete line are given, as well as recommendations for application.

Circle No. 36 on Postcard

•

Subsurface Pumps

Harbison-Fischer Manufacturing Company has issued a new 34-page supplement to its general catalog. The oil well subsurface pumps and related production equipment are designed for deep wells, stripper wells and sandy fluid production.

Circle No. 37 on Postcard

•

Mud Testing Equipment

The entire line of mud testing equipment made by Geophysical Machine Works is described in a new catalog. Included are Fann mud balances and V-G meter and accessories; Fann portable and multiple filter presses; small pressure adapters for older types of filter presses; and mud mixers.

Circle No. 38 on Postcard

Air Equipment

A new catalog on Aircomatic equipment and wires made by Air Reduction Magnolia Company describes the gun for manual operation, the head for automatic operation and wires for use with either manual or automatic equipment.

Circle No. 39 on Postcard

•

Aerial Surveys

A two-color brochure available from Abrams Aerial Survey Corporation describes survey and mapping services. Equipment and methods used are illustrated.

Circle No. 40 on Postcard

•

Water Conditioning

"Products and Processes for Industry," a new manual of Infilco Inc., is concerned with water conditioning, sewage and trade waste treatment equipment.

Circle No. 41 on Postcard

•

Filters

Engineering data on synclinal type filters for sump or line installation on all hydraulic and low pressure liquid recirculating systems is contained in a new folder published by Marvel Engineering Company.

Circle No. 42 on Postcard

•

Corrosion Data

A 12 x 9-inch wall chart available from The Carpenter Steel Company gives corrosion resistance information on several analyses of stainless steel tubing and pipe.

Circle No. 43 on Postcard

•

Gears

Power transmission equipment and component machine parts made by Boston Gear Works are discussed in a new folder available from Geo. J. Fix Company.

Circle No. 44 on Postcard

Tube Fittings

Dimensional information, cross section drawings, installation recommendations and assembly instructions on Swagelok Tube fittings are included in a new catalog published by Crawford Fitting Company.

Circle No. 45 on Postcard

•

Metal Primer

Rusticide Products Company has issued a four-page folder, "Worried About Rust," which describes the use of Ospho, a metal primer applied directly over rusted surfaces to stop rust and prime metal for paint.

Circle No. 46 on Postcard

•

Rotameters

The complete line of Brooks Rotameter Company products is presented in a new bulletin. The rotameters range from the Brooks-Mite for small flow indication of liquids or gases to high capacity, high pressure meters.

Circle No. 47 on Postcard

•

Pumping Motors

E-M Synchronizer No. 34, published by Electric Machinery Manufacturing Company, contains the story of how the world's biggest motors for oil pipe line pumping were designed and built.

Circle No. 48 on Postcard

•

Valves for Boilers

A bulletin on valves for boiler services, such as surface blow, bottom blowoff, water column blowoff and connections, has been published by Everlasting Valve Company.

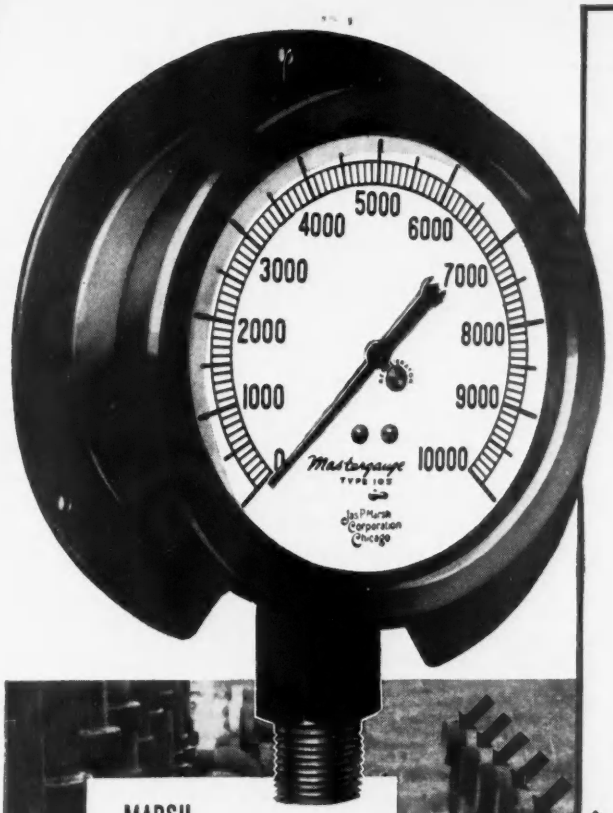
Circle No. 49 on Postcard

•

Plastic Pipe

"The Use of Tenite to Combat Corrosion in Piping Systems," a new book by Tennessee Eastman Company, is the illustrated story of noncorrodible butyrate plastic pipe in the oil fields.

Circle No. 50 on Postcard



It begins where other gauges leave off-

The now recognized ability of the Marsh Mastergauge to do a better job for more years is a direct result of setting out to design and build an instrument possessing accuracy, precision, and stamina beyond any gauge that had ever been produced.

Try the Mastergauge where other gauges have failed — under the gruelling conditions of extreme temperature, heavy pulsation, racking vibration — conditions that wreck the ordinary kind. You will find that it truly begins where others leave off.

We can say this today without fear of contradiction because Mastergauge has *said it for itself* . . . in thousands of applications throughout the oil country.

And remember: The toughest gauge to knock *out* of adjustment is the easiest gauge to get back *in* adjustment . . . thanks to the exclusive "Marsh Recalibrator."

Ask your supply store, or write us, for Marsh Oil Industry Bulletin.

MARSH INSTRUMENT COMPANY
Sales affiliate of Jas. P. Marsh Corporation

Dept. K, Skokie, Ill.

The Marsh branch plant at Houston offers shipment from stock and advanced facilities for repairing all makes of gauges.

MARSH MASTERGAUGE —

Marsh Mastergauge, guaranteed accurate within ½ of 1% of reading—a precision gauge for a precision industry. The Mastergauge line also includes gauges especially designed for blenders, boilers, burners, capping, Christmas trees, columns, heaters, hydrogen units, instrument panels, pumps, Reid vapor bombs, scrubbers, separators, mud pumps, stills, towers and other applications. A typical installation is this even dozen of Mastergauges in distillate fields, Cranfield, Miss.

MARSH GAUGES

STOCKED by Your Local Supply Store

Catalogs AND EQUIPMENT *Literature* OFFERED IN THIS ISSUE'S ADVERTISEMENTS

Copies may be obtained easily and without cost by using Reader Service Postcard. Just circle on the card the number at the end of each item in which you are interested.

MACHINE SHOP SERVICE—Acme Foundry & Machine Co. See page 242.
Circle A2 on postcard.

DIRECT FLOW PUMPS—Data Sheets. The Aldrich Pump Co. See page 204.
Circle A5 on postcard.

PUMPING UNITS—Catalog 151. American Manufacturing Co. of Texas. See page 6.
Circle A10 on postcard.

SAND-BANUM—Literature. American Sand-Banum Co. See page 162.
Circle A11 on postcard.

TRAVELING BLOCK ASSEMBLY — Literature. Baash-Ross Tool Co. See page 69.
Circle B3 on postcard.

BULLDOZERS—Engineering Bulletin 896-B. The Baker Manufacturing Co. See page 311.
Circle B4 on postcard.

CANADIAN OIL INDUSTRY BROCHURES. The Bank of Nova Scotia. See page 282.
Circle B8 on postcard.

PIPE TOOLS—Catalog No. 51. Beaver Pipe Tools, Inc. See page 245.
Circle C2 on postcard.

CONDENSATE RECOVERY UNITS — Bulletin. Black, Sivalls & Bryson, Inc. See pages 180 and 181.
Circle C8 on postcard.

LIQUID LEVEL CONTROL—Catalog 103. Black, Sivalls & Bryson, Inc. See page 191.
Circle C9 on postcard.

DRAWWORKS—Catalog. The Brewster Co. See page 91.
Circle C12 on postcard.

PUMPS. Canadian Allis-Chalmers Limited. See pages 245 and 305.
Circle D6 and D7 on postcard.

BOOKLET — "FOR OIL & ALLIED INDUSTRIES." The Canadian Bank of Commerce. See page 293.
Circle D9 on postcard.

UNION AND CHECK VALVES—Catalog 11. Catawissa Valve & Fittings Co. See page 335.
Circle D11 on postcard.

DEPTHOMETER—Folder. The Cavins Co. See page 305.
Circle E1 on postcard.

SWIVEL JOINTS—Catalog No. 50-C. Chiksan Co. See page 324.
Circle E4 on postcard.

CHAIN. Columbus McKinnon Chain Corp. See page 152.
Circle E7 on postcard.

WELL SERVING WINCH TRACTORS—Specifications. Fred E. Cooper, Inc. See page 275.
Circle E9 on postcard.

GATE VALVES—Circular 1864. Crane Co. See page 41.
Circle E12 on postcard.

NEOPRENE NOTEBOOK. E. I. du Pont de Nemours & Co. See pages 198 and 199.
Circle F6 on postcard.

DRILLING RIG AND ROTARY TABLE—Bulletin F-185. Emsco Derrick & Equipment Co. See page 131.
Circle F12 on postcard.

PUMPING ENGINES. Fairbanks, Morse & Co. See page 209.
Circle G2 on postcard.

COMPRESSORS—Bulletin C-5. Fuller Company. See page 193.
Circle G6 on postcard.

PIPE COATING. The Goodyear Tire & Rubber Co. See page 5.
Circle H1 on postcard.

REAMER—Bulletins. Grant Oil Tool Co. See page 336.
Circle H3 on postcard.

PIPE COUPLINGS. Harrisburg Steel Corp. See page 244.
Circle H11 on postcard.

ROCK CUTTER BITS—Catalog. Herb J. Hawthorne, Inc. See page 87.
Circle H12 on postcard.

CASING HEADS—Bulletin No. 310-G10. Hercules Tool Co. See page 206.
Circle J2 on postcard.

CARRYABLE GENERATOR. Homelite Corp. See page 67.
Circle J5 on postcard.

PREFABRICATED BUILDINGS — Survey Estimates. Houston Ready-Cut House Co. See page 220.
Circle J7 on postcard.

PARAFFIN SCRAPERS. J. M. Huber Corp. See page 338.
Circle J8 on postcard.

GAS LIFT VALVES—Bulletins. The International Nickel Co. See page 29.
Circle K5 on postcard.

PUMPING UNITS. Jensen Brothers Mfg Co. See page 214.
Circle K7 on postcard.

MOTORIZED DRILL RIGS—Bulletin. Joy Manufacturing Co. See page 89.
Circle K12 on postcard.

FLASHLIGHTS AND LANTERNS—Catalog. Justrite Manufacturing Co. See page 321.
Circle L1 on postcard.

METAL STAMPINGS—Booklet. Kelley Manufacturing Co. See page 330.
Circle L3 on postcard.

AUTOMATIC MUD RELIEF VALVES—Bulletin 11250. Kinzbach Tool Co. See page 332.
Circle L8 on postcard.

GRAVEL PACK. The Layne and Bowler Co. See page 12.
Circle M5 on postcard.

SAFETY PLUGS. Lone Star Tool Co. See page 158.
Circle M10 on postcard.

RECORDER—Bulletins. Lucey Export Corp. See page 257.
Circle M11 on postcard.

DRILLING MUD—Booklet. Magnet Cove Barium Corp. See page 145.
Circle N2 on postcard.

GAUGES—Bulletin. Jas. P. Marsh Corp. See page 77.
Circle N4 on postcard.

PIPE RECOVERY SERVICE—Catalog. McCullough Tool Co. See page 341.
Circle N6 on postcard.

PUMPS—Catalog. McGowan Pump Co. See page 326.
Circle N7 on postcard.

TRAVELING BLOCKS—Catalog. McKissick Products Corp. See page 18.
Circle N8 on postcard.

SAND PUMPS—Price list. Miller Sand Pump Co. See page 218.
Circle P1 on postcard.

ROTARIES—Bulletins. The National Supply Co. See page 54.
Circle P5 on postcard.

LINERS, ASSEMBLIES, LINER PULLERS—Catalogs. Oil Well Manufacturing Corp. See page 102.
Circe Q1 on postcard.

WEED KILLER—Literature. Pacific Coast Borax Co. See page 302.
Circle Q5 on postcard.

PARAFFIN SCRAPERS. Petroleum Specialty Co. See page 215.
Circle R3 on postcard.

AIRCRAFT—Brochure. Piper Aircraft Corp. See page 63.
Circle R4 on postcard.

LEAK PREVENTER. Rectorseal. See page 210.
Circle R8 on postcard.

ORIFICE METERS — Bulletin 1050. Rockwell Manufacturing Co. See page 13.
Circle S4 on postcard.

WIRE ROPE AND SLINGS. John A. Roebling's Sons Co. See page 31.
Circle S5 on postcard.

MUD PITS. S & R Tool & Supply Co. See page 305.
Circle S7 on postcard.

BLOWOUT PREVENTER AND STRIPPER—Catalog. Shaffer Tool Works. See page 24.
Circle S12 on postcard.

PREFABRICATED BUILDINGS. Southern Mill & Manufacturing Co. See page 312.
Circle T3 on postcard.

BOOKLET "How to Make Drill Pipe Last Longer." Spang-Chalfant Division, The National Supply Co. See pages 52 and 53.
Circle T5 on postcard.

HYDRAULIC PULLERS—Bulletin. Templeton, Kenly & Co. See page 166.
Circle T9 on postcard.

TORQUE CONVERTER—Bulletin 135.D. Twin Disc Clutch Co. See page 329.
Circle U7 on postcard.

WIRE ROPE TON MILE INDICATOR AND LOG BOOK. Union Wire Rope Corp. See pages 96 and 97.
Circle U8 on postcard.

WIRE ROPE—Bulletin. Wickwire Spencer Steel Division. See page 150.
Circle V12 on postcard.

Exploration Section

L. J. LOGAN, SECTION EDITOR

WORLD OIL

CHAPTER NINE *in the Fascinating Story of the Search for Oil*

THE REFRACTION SEISMIC TECHNIQUE was developed in Germany and reduced to practice by L. Mintrop of Germany. First use of the instrument in North America was in Mexico and the Gulf Coast of Texas and Louisiana. Refraction crews began working in the Gulf Coast region about 1924, and were credited with the first seismic discovery in the United States. This illustration shows an early model Mintrop Instrument. When records were being made, the tent flaps were dropped to form a dark room. Tremendous explosions were detonated to induce waves into the earth. A detector . . . with three to five spaced one mile apart in an arc . . . was placed immediately in front of the recording instrument, and it transmitted the wave motion to sensitized paper by means of a light beam.

SUPERIOR INSTRUMENTATION is still a master key to progress in the search for hidden oils traps; however, a second factor is equally important in present-day exploration. That factor is accurate interpretation of the complex data obtained. With a backlog of more than 16 years' experience . . . plus a record of leadership in instrument improvements to meet specific needs for various areas... General Geophysical is better equipped to determine and locate conditions favorable to finding new oil reserves. So when you plan to explore new areas and deeper horizons, let General's capable crews help you. They have an enviable finding record from the Gulf Coast to Canada.

General GGC

GEOPHYSICAL COMPANY

GULF BLDG. HOUSTON

A PRINT OF THIS ILLUSTRATION SUITABLE FOR FRAMING WILL BE SENT ON REQUEST

Greetings

—Halliburton

Typical road through heavily-wooded northern bush is firm and easily traveled during winter but vanishes when the spring thaw melts the frozen muskeg.

Geophysical Operations In the Canadian Bush

By J. K. MacMILLAN

President, Northwest Seismic Surveys, Ltd., Calgary, Alberta

GEOPHYSICAL operations in the bush country of northern Alberta have presented so many obstacles and problems that geophysical operators are being forced to devise and revise techniques and equipment to operate efficiently both winter and summer at costs which are reasonable to the oil companies. Perhaps of even greater importance is the problem of providing crews with the best possible living conditions, the finest food and, whenever possible, recreational facilities that will help them withstand the climate, hard work, and tedium of long periods in the bush before they are rotated.

Following are a few of the important problems of the typical working and living conditions and some of the experiences met with in the northern bush and muskeg country since late 1949, when operations were started with two crews working the Keg River area, about 125 miles northwest of the town of Peace River. With the growth of the company to its present size of 11 exploration parties operating in widely scattered areas of Alberta, five between Peace River and the Northwest Territories, considerable experience has been gained to dictate design and operation of equipment and techniques, enabling units to work with a remarkable degree of efficiency during winter operations when temperatures stay continually below zero and drop to what were regarded as hitherto unworkable lows of —60 degrees; and during the summer when cleared trails disappear into a seemingly bottomless morass of

COLD WEATHER reaching to —60° F., muskeg which can swallow tractors and bulldozers without a trace, and wild animals are but a few of the dangers confronting geophysical parties in Canada's northern bush country. But difficult as it is to keep the spirit of an isolated camp crew at peak level, it is not impossible. That is fortunate, for it is these advance guards of the petroleum industry whose task it is to determine whether oil indications exist to merit the tremendous effort required to drill a wildcat in the bush country.

Tractor-mounted drill "on the move" during the summer.

Power wagon and fuel tank on a typical summer road.

water and muskeg, when mosquitoes and black flies plague and tax the endurance of the hardiest men, and when most of the supplying of the crews has to be done by air.

Typical of the winter problems of a seismic operation in the bush country were the experiences of two crews sent early in 1950 to a centrally-located camp, about 30 miles west of the Grimshaw-Hay River road, near the federal government weather station and Hudson's Bay Company trading post at Keg River. The area was quite accessible. During winter a wheeled unit could go anywhere a bulldozer could break trail. Temperatures were severe, and official January figures at the weather station at Keg River showed a mean of —22 degrees, with a high of zero, and a low of —57 degrees. It is significant that even in this extremely cold weather, only two operating days were lost.

The camp was furnished with modern, insulated, trailer units including four-man bunk trailers, cooking unit and facilities, dining hall which doubled for recreation duty, hot and cold running water, toilets, showers, and washing machines in the utility layout.

Supply, especially critical breakdown items, was a major problem, and the lack of an expediting service in Peace River town caused critically-needed shipments to go astray in attempting to keep up with progress of field parties needing the materials.

Fuel for tractors and trucks was another worry, for, to keep a portable camp mobile, storage facilities were severely limited. Area distributors were taxed their utmost to haul fuel to various crews which had descended almost without warning into the district. Nevertheless, much credit must go to the refined product distributors for their efforts in keeping crews supplied.

Standard trucks were employed in field operations and a trained mechanic with an adequate stock of spare parts was kept with the crews.

Giving credit to drivers, as well as to the skill of the bulldozer operators who did the roadwork, damage to trucks was confined mainly to springs and hydraulic lines. Actually, most of these difficulties could be laid to the severe weather. One has to repair and replace a broken spring only once in the open air at —25 degrees to become a cautious truck driver. Ignition troubles were few although, when the temperature fell below —30 degrees in the evenings, it was necessary to keep a man on duty idling the truck engines. To the cost-minded contractor, the throaty roar of 18 trucks consuming 50-cent a gallon gasoline in the dead of the sub-Arctic night is an awe-inspiring sound.

Communications Good

Communication problems were not acute, except during peak disturbance periods of radio channels. However, this is a mixed blessing. One may, if the radio is bad, bypass the armchair strategist.

Medical care was not a problem, fortunately, though with some employes the thought that a doctor was not available brought out the worst in a hypochondriac. The camp was equipped with the usual first aid kits, and drugs were kept for emergencies. Whiskey and aspirin were the standard cold and fever remedy, and men were backed by the assurance that the client had an aircraft available and on call should additional help be required.

The item that has caused the greatest concern to the contractor involved in camp operations of this type has been the problem of keeping the spirit of an isolated camp crew at a peak level. None of the men was familiar with life in a bush camp, let alone the confining effect of very severe weather.

The prime morale builder is a good cook, coupled with the most of the best food obtainable. The temperamental nature of camp cooks is renowned and this company has certainly encountered its share of culinary pyrotechnics. Company cooks were persuaded, within reason, that crew hours must govern the cook's hours in the camp. This was brought about not without difficulty. Working on bulldozer trails, it became critical, at times, to finish a line remote from camp rather than have to take a spine-jarring ride back to the end of the line to catch a couple of holes next day. Cooks were taken on some of these rides and the operations explained. As a result, the boys were assured that a hot meal, served with a smile, would be available if they got back to camp at 10 p.m., which was not infrequent. Conversely, crews made an effort to come in at regular hours.

The camp had an attendant whose duty it was to clean trailers, make beds, fill fuel tanks of trailer stoves and generally make ready for the crew's comfort when they returned each night. Some quarters regard this

"non-producer" as a luxury, but the attendant was a real asset.

Camp canteens were operated on the honor system, which worked admirably. At considerable non-recoverable cost, 16-millimeter sound movies of late issue were shown almost nightly. A nominal charge was made so the men would feel free to criticize the selections, which, incidentally, was done frequently.

Married men were somewhat restive, since it was impossible to provide facilities and accommodations in camps for wives and families. An effort is made to limit a bush tour to three months.

This company's first venture in the bush was an economical success from the contractor's viewpoint, but it was astounding to learn the nearly astronomical cost of operating a conventional crew working behind bulldozers in the frozen bush. Another problem affecting costs, besides clearance of right of way, was drilling. For a country so wet in summer, there is a remarkable shortage of usable water holes for drilling water in the winter. Consequently, winter drilling operations were usually limited to a single tank load of water per shift.

During the summer of 1950, the company was not prepared to move back to the same area for portable operations. All spare time was spent planning a mechanized operation for the following winter.

Specifically, the problem resolved to a reduction in expensive manpower who must be adequately sheltered and fed, a limitation on the quality of bulldozed operational lines to give a lower cost per mile, additional camp portability so that units might traverse rough lines to reduce crew travel time, and the evolution of a new type seismic drill which might operate with less men and little or no water. Fortunately, instrumentation was not a problem, as new highly portable seismic equipment was placed on the market at this time.

As a result of efforts to reduce operational costs without seriously impairing production, the company moved back to the Keg River area in the winter of 1950-51. Skid-based trailer units for the camp were employed; one medium weight bulldozer per crew was used to break trail and move camp; and two new type drills, mounted on crawler tractors, were provided. A light track-type personnel trailer towed by a wheel tractor with track treads and a general purpose four-wheel-drive track were utilized for emergency supply service. Manpower for this crew was limited to nine, including a cook and a general handyman-mechanic.

Specially designed and adapted track-type vehicles and trailers are in common use in the northern muskeg country. Note sponge-like character of muskeg.

Operations were carried out with indifferent to fair success with these crews, the limitation being confined primarily to new drills. It had not been possible to field test these units prior to shipping to the bush and the result was an unending series of mechanical and structural failures.

In general, the men were superb under these difficulties. They believed they were adding materially to the store of experience being gathered by all operators in the north, and most of them felt their contributions would assist in deriving an answer which might eventually provide an economical solution to operations in the bush. They modified and patched with the limited materials available, often working all night so drills might get out to the field next day.

Again, the general picture was successful, since relatively fair production was obtained at what might be considered a reasonable cost-per-profile.

When spring thaws started in late March, all units were towed to high ground and the crews moved "outside" for a well-deserved rest. No special precautions are taken to protect equipment left behind for "break-up" of the winter ice. Rust is not a problem; and human pillage or wilful destruction is impossible because of inaccessibility. The only marauders are occasional black or brown bears which may break into a trailer out of curiosity.

Some dictionaries do not carry a definition of the term "muskeg," perhaps because those who have experienced its properties utilize unprintable language. In the summer, it consists of a floating mass of peat and vegetation, dotted by hummocks of spruce and tamarack. The mass is water saturated down to clay hardpan, which may lie at a depth of 50 feet. In summer, it will not support the weight of a man without his sinking to his thighs. In the winter, it may carry the heaviest of equipment, depending upon frost penetration. Because of the heat generated by decaying vegetation, muskegs are dangerous in the coldest winter. One contractor last fall had a large tractor and 'dozer sink while crossing a soft spot. When normal salvage methods failed to locate it, a dragline was shipped in. The blade was contacted at a depth of almost 30 feet, but the machine could not be recovered.

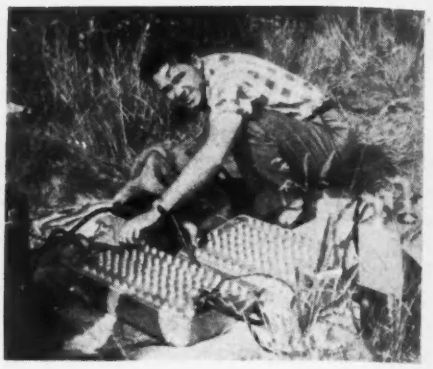
Normally, the working season for standard equipment is from mid-November to the earliest thaw, near the end of March. Then follows the

About the Author

J. K. MacMILLAN, president, Northwest Seismic Surveys, Ltd., Calgary, Alberta, was graduated in 1939 from the University of Alberta with a B.S. degree in mining engineering. After graduation, he was production engineer for Trinidad Leaseholds, Ltd., at Trinidad, B.W.I., until 1943, when he joined Imperial Oil Limited in the same capacity. Associated with the Canol project at Norman Wells, Northwest Territories, in 1945 and 1946, MacMillan became service engineer for Dowell Incorporated at Calgary in 1946, and later sales engineer for Union Tractor & Equipment, also at Calgary. In 1947, he organized Northwest Seismic Surveys for Canadian operations.

Stringing out geophone cables in subzero climate in the Peace River area of Alberta.

Tractor-mounted drill crosses river in Northern Alberta.



Setting up portable seismograph instruments on a job in the bush country southwest of Peace River.

breakup during which operations are impossible because of rapid runoff from the hill areas to the poorly-drained lowlands and because of a provincial government ban placed on truck travel on all main highways while the frost comes out of the ground.

It has been the summer season which has kept all operators busy designing equipment with enough track area to support drills and seismic instruments and yet retaining lightness so they may be either self-propelled or towed by light tractors.

There are as many varied designs of equipment now being used as there are men responsible for making decisions concerning operations. It may be several years before enough experience is accumulated to produce units which may be accepted as standard for the industry.

Following the spring breakup of 1950, drills used for the winter by this company were scrapped, and when the call came to get back to the field again the new design was not yet available.This time, then, operations were truly portable due to the nature of the muskeg described above. Shot holes were dug with hand augers of the post-hole type. Each member of the crews took a turn as a driller, and within a short while much new terminology had been added to the already colorful vocabulary of the geophysical driller's profession. This was an advancement heretofore considered improbable, if not impossible. It was learned on reliable authority that the most successful of the drillers was a bantam mechanic who named his augers after the president and vice president of the company.

New power-operated drills were put into service in August, but it is too early to assess their value, though a marked improvement is expected.

Few non-technical problems are presented to the contractor. One, however, that sometimes seriously handicaps efficiency is the prevalence of foxes, rabbits and squirrels. Rabbits have an insatiable appetite for geophone cable insulation. Foxes are a more sporting type. They are inclined to take single quick snaps which may neatly and completely sever the cable. The result is that usually once a day a complete washout occurs on a spread which only moments before had tested closed.

In this connection, at this company's request, the University of Alberta developed two grades of deterrents to coat cables. While not conclusive, their use seemed to discourage rabbits. But foxes continue to make off with the geophones and effectively slash at least 20 conductors at each snap at the lines. It is illegal to shoot fur-bearing animals in a trap line area, so field operators suffer in supposed silence and have become adept at cable splicing.

First Lick

Hazards of field operations are not limited to technical and terrain bugaboos. Two winters ago, a midnight shift tractor operator was walking alone to his machine some distance down the line. He heard a sniffing sound at his hip pocket where he was carrying his lunch. Turning and flashing a light, he spotted five wolves padding behind him like big tame hounds. Four disappeared as he swung a small hammer at the head of one hungry animal. His story was ridiculed at camp next morning, but he led the party to his truck, where the evidence lay frozen stiff with a battered skull.

Occasionally, hibernating bears have been turned out by the bulldozers from what appear to be piles of rubble in the trails. The animals are too startled and sluggish to be cranky and usually amble away in search of a more secure abode. Black and brown bears are troublesome around camps in the spring and summer as they search for food. Once fed, they become a friendly nuisance.

The most serious operating problem confronting the geophysical industry in Alberta is the acute shortage of trained personnel. Seismic activity alone has increased about seven times its 1947 level, reaching this fall a peak of about 140 crews. The entire oil industry has experienced similar growth, resulting in keen competition for technical operators. Not only does such competition exist between the geophysical branch of the industry and all others but also there is a lack of understanding among the geophysical contractors. This may be regarded generally as a healthy sign of our expanding economy, but it has given rise to a cold war in the technical salary brackets, resulting in a disproportionate labor cost rise as compared to increases in contract rates.

This problem also exists in the helper class which has responsibility of handling trucks. In some cases, attitudes have been aggravating from an equipment damage and consequent lost time record. This situation has been reflected in a general increase in insurance rates early this year, and there are indications of a further increase shortly.

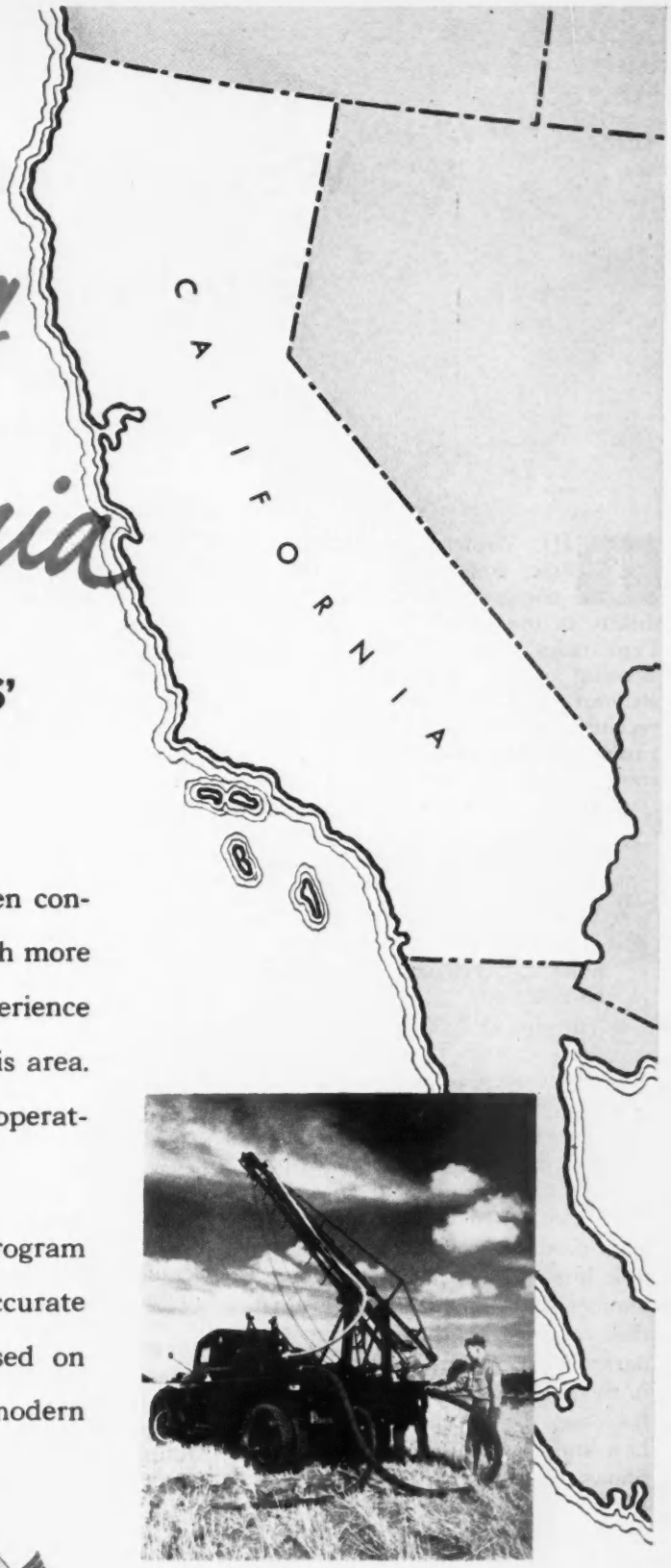
It has sometimes been hard to hold a crew to a rigid work schedule in the bush, for the attitude exists that jobs on the plains are plentiful and life near the towns more exciting. This summer, a cook from a bush crew walked out 90 miles to the road and, arriving at Peace River headquarters, said our camp was in a uproar because of intolerable conditions. Radio contact with the crew nipped this in the bud, when they replied that their food was now infinitely better since they had to cook it themselves.

In the majority of cases, however, key personnel have been extremely faithful and reliable, and the success of our field operations to date can be laid to a nucleus of enthusiastic and loyal "doodlebuggers."

Pioneering

SINCE 1931

IN *California*



OVER 55 CREW-YEARS' EXPERIENCE . . .

For over 20 years, G.S.I. has been continuously exploring the Golden State with more than 660 accumulated crew-months' experience in off-shore and land seismic work in this area. At the present time, five G.S.I. crews are operating in California.

Wherever or whatever your exploration program . . . G.S.I. is ready to serve you with accurate seismic surveys and interpretations based on *experience,* skilled personnel and proved modern techniques and equipment. Call in G.S.I.

G S I

GEOPHYSICAL SERVICE INC.

6000 Lemmon Avenue • Dallas, Texas

Western Anadarko Basin Geophysical Problems

By NEAL CLAYTON
Century Geophysical Corporation, Tulsa

THE WESTERN PORTION of the Anadarko Basin, comprising an area of about 4,500 square miles, has for years been a headache to the geophysicist. Recent discoveries in the area, coupled with an increased demand for petroleum products, may force a number of companies to re-evaluate their acreage here. The problem of obtaining reliable geophysical information has been the greatest hindrance to exploration in the past. Some recommendations are made for improving the quality of the geophysical information obtained in the area.

THE Western Anadarko Basin, comprising an area of about 4500 square miles, lies mostly in the Oklahoma and Texas Panhandles. Figure 1 shows the relationship of the area to the major structural features and to the most recent discoveries. In the past, exploration and development of this province has been slow for several reasons:

- A lack of reliable beds for surface mapping. Most of the area is covered with reworked Tertiary material or beds of gypsum.
- The expense involved in the use of the core drill, since fairly deep holes are required for reliable correlations.
- The cost of drilling wildcat wells deep enough to test the entire sedimentary section.
- Finally, the inability to obtain reliable geophysical information which would justify the drilling of deep tests.

The increased demand for petroleum products, coupled with the possible loss of Iranian oil, may force a number of companies to re-evaluate their acreage in the Western Anadarko Basin. A consideration of zones in the geologic section where production may be expected will indicate how important this area may become. Shows of oil or gas have been reported at widely scattered localities in the following zones: The Douglas and Cleveland sands of the Upper Pennsylvanian; the Morrow and Atoka sands of the Lower Pennsylvanian; the Kinderhook, St. Louis, and Spergen limestones of the Mississipian; the Hunton limestone of the of the Siluro-Devonian, and the Simpson sands of the Ordovician.

A recent discovery several miles northwest of the Lips Ranch field in Ochiltree County, Texas, was completed in the Atoka series or basal Pennsylvanian. This well was The Texas Company's McGarraugh 1-B. The Carter Oil Company-Stanolind Oil & Gas Company's Garrett 1, west of the Elk City field in Beckham County, Oklahoma, was recently completed from a basal Pennsylvania detrital zone. As a result of encouraging shows encountered in similar Pennsylvanian detrital material and in truncated pre-Pennsylvanian beds, Phillips Petroleum Company was drilling a third well in northern Gray County, Texas. These recent developments are indicated by arrows in Figure 1.

Figure 3 shows the changes which occur in the geologic section below the Chase formation of the Lower Permian from Southwestern Hansford County, Texas, to western Dewey County, Oklahoma. Gulf Oil Corporation's Collard 1 in south central Hansford County was obviously on a sizable pre-Pennsylvanian structure, but failed to make a producer.

Figure 4 is a similar geologic section in a north-south direction, extending from western Beaver County, Oklahoma, across the Lips Ranch field to southern Roberts County, Texas. The Lips Ranch structure is similar to the one previously mentioned in Hansford County, being primarily pre-Pennsylvanian in age.

The possibility of stratigraphic traps, especially in the Lower Pennsylvanian, around the northern and western rims of the basin should be apparent from the cross sections. The presence locally of terracing, plus a facies change, could provide the proper conditions for a sizable oil field. The Ringwood pool in Major County, Oklahoma, is an example of this type of accumulation. The new deep production currently being developed near Liberal, Kansas, may be due to similar conditions along the east flank of the Hugoton Arch.

What geophysical methods can be used in this area to reveal subsurface structural conditions in advance of the drill? It is generally accepted that neither the magnatometer nor the gravity meter will give quantitative measurement of geologic structure. In addition, both methods may, in certain instances, reveal anomalies which may be unrelated to structural conditions. Conversely, in some instances favorable structures may have no magnetic or gravitational expression. Both methods, however, may be used to indicate the orientation of trends, provided regional gradients are treated properly. In general, the "easy" areas for most geophysical methods have been pretty thoroughly worked over in the past. Refinements in interpretation are needed for these, as well as for most other geophysical methods.

The refraction seismograph has been used in some parts of the Ana-

Typical "Blue Demon" Cuttings made by shot hole drillers in Texas.

Here's Why Shot Hole Driller's Everywhere Call for

"BLUE DEMONS"

Geophysical crews everywhere have found one bit to depend on for ALL tough drilling at minimum cost . . . their Hawthorne "Blue Demon" Rock Cutter.

Cuttings shown above . . . sandy clay and shale, sandstone, limestone, loose and cemented gravel, chert and caliche . . . all tell their own story. Most are too tough for ordinary drag bits. Some ball up rock bits. "Blue Demons" drilled them all.

"Blue Demons" efficiently drill all soft and 90% of the medium and hard formations encountered by geophysical crews. Exclusive bit features assure exceptional footage . . . constant gauge size . . . clean, fast hole.

The result is clean holes for quick, easy loading, faster drilling, fewer round trips and drastically reduced bit costs, as drillers on 900 drills around the world know.

HAWTHORNE "BLUE DEMON" ROCK CUTTER BITS

REPLACEABLE BLADES 1⅞"-10"

WRITE FOR ILLUSTRATED CATALOG

HERB J. HAWTHORNE INC.

P. O. BOX 7366, HOUSTON 8, TEXAS

darko Basin where usable reflection results are difficult to obtain. The Lips Ranch structure on the Ochiltree-Roberts County line was found by this method. This structure has a considerable amount of relief below the Pennsylvanian, which made its detection possible. On the other hand, certain factors inherent in the refraction method prohibit its use in locating structures of low relief. The reflection seismograph alone remains as the only means for detailing structures of this latter type. Therefore, some method must be devised for obtaining reliable reflection data in the western part of the Anadarko Basin.

Both the Oklahoma and Texas Panhandles may, with a few local exceptions, be considered as poor response areas for the reflection seismograph. Paul Lyons of Carter indicated this in a paper presented in December, 1950, at the Regional Exploration Meeting, Society of Exploration Geophysicists, held in Fort Worth.

It is generally believed that the

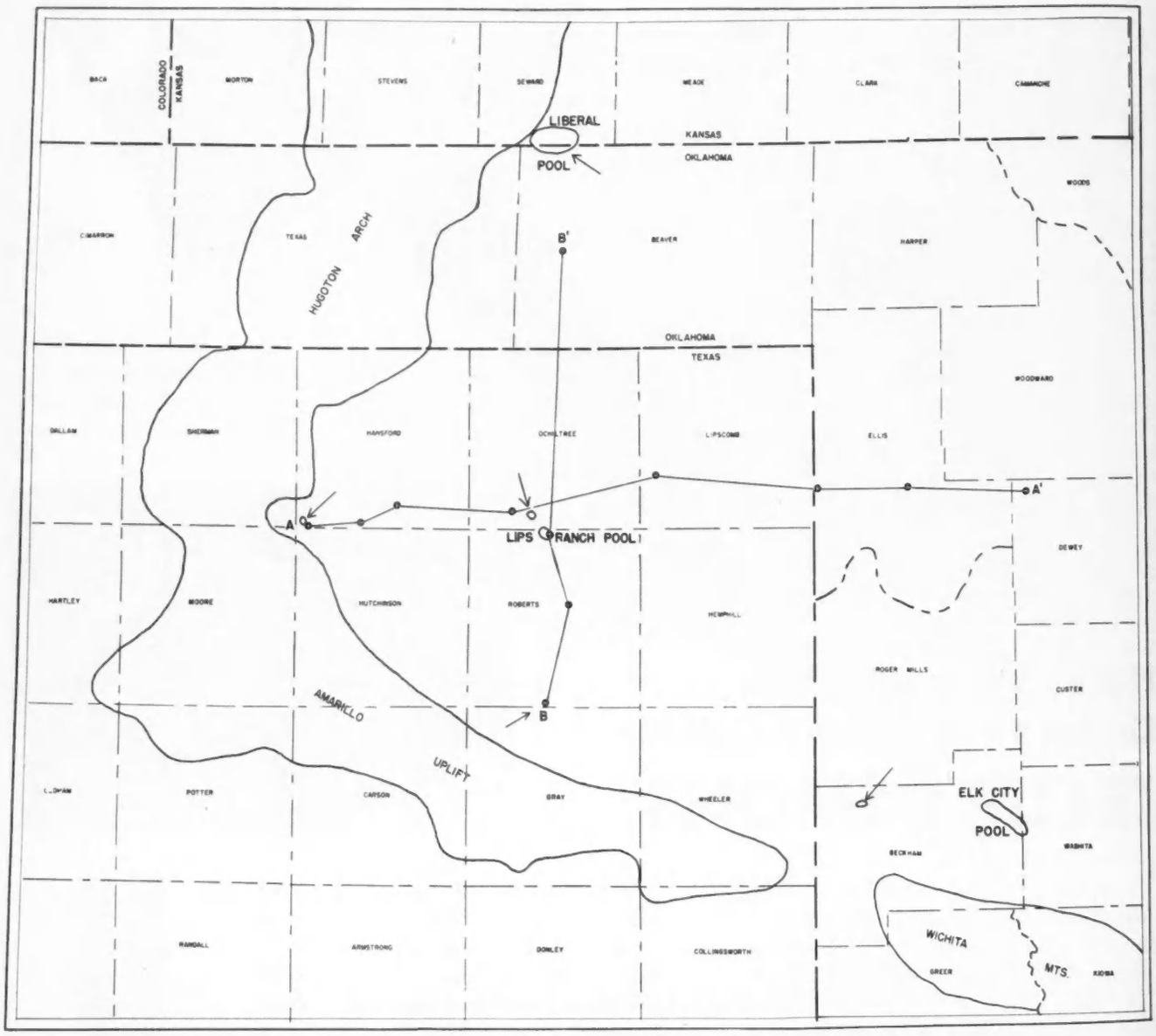


FIGURE 1. Location map of the Western Anadarko Basin with recent developments indicated by arrows.

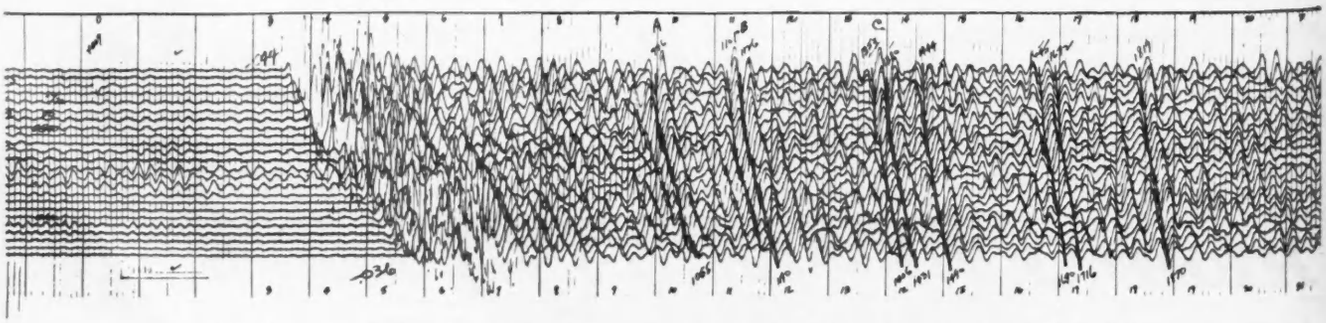
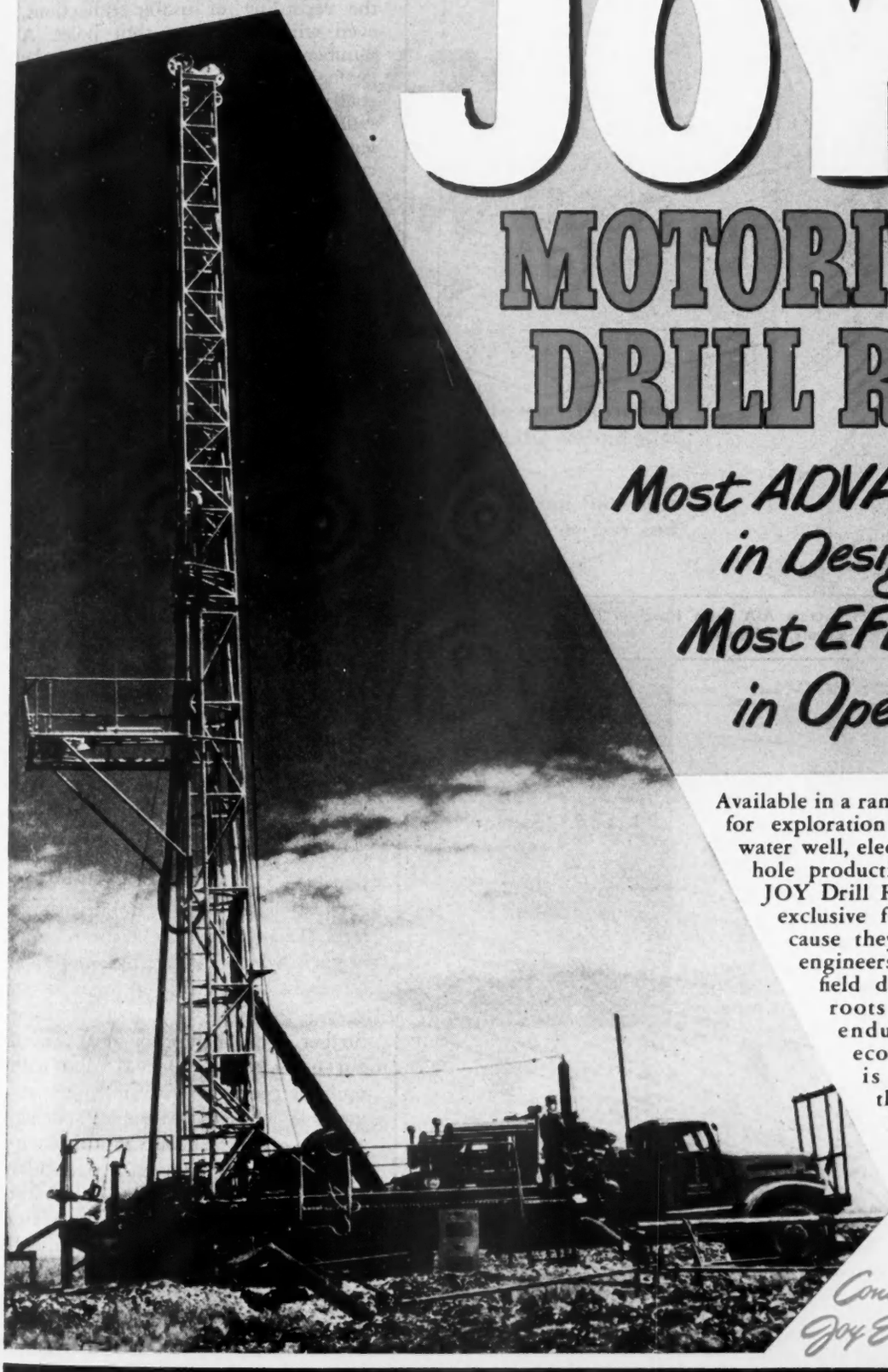


FIGURE 2. Seismic reflection record obtained in Beaver County, Oklahoma, using Poulter Method.

1851-1951... One Hundred Years of Engineering Leadership

JOY
MOTORIZED DRILL RIGS

Most ADVANCED in Design—
Most EFFICIENT in Operation!



Available in a range of heavy-duty models for exploration drilling, seismograph, water well, electrical logging or slim-hole production drilling to 5000′. JOY Drill Rigs incorporate many exclusive features you'll like, because they're built by practical engineers—men who know oil-field drilling from the grass roots down. ● For speed, endurance, mobility and economy, your best bet is a JOY rig—built by the world's oldest and largest producer of core drills and motorized drill rigs.

Write for Bulletin, or

Consult a Joy Engineer

W&D O 3002

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

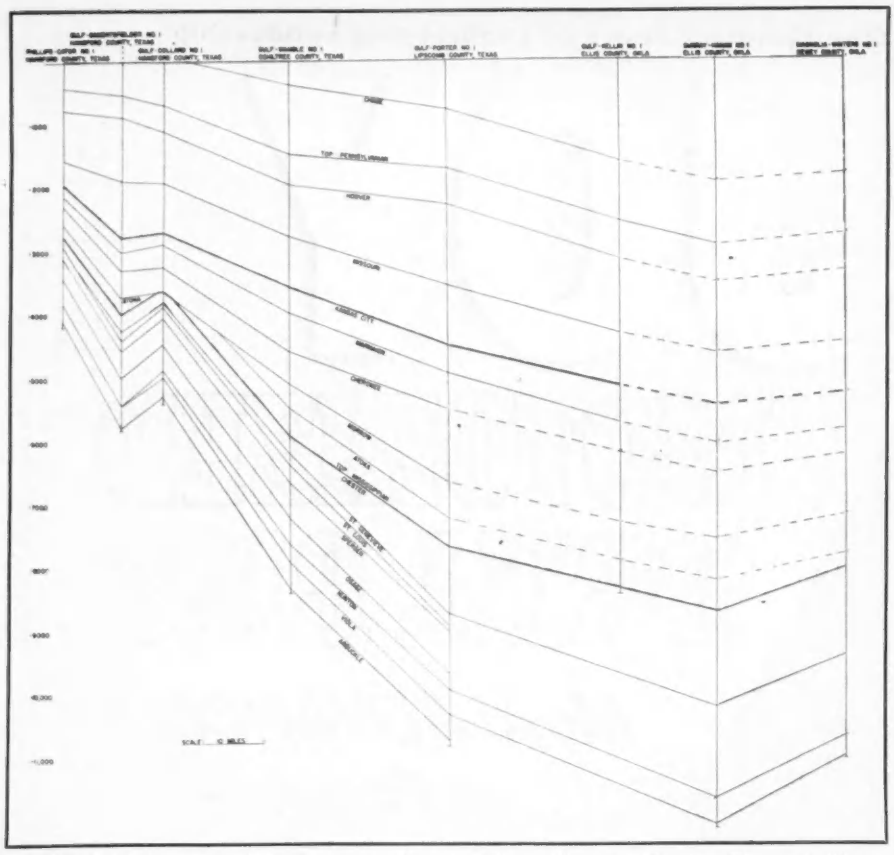


FIGURE 3. East-west geological cross-section A-A' from Hansford County, Texas, to Dewey County, Oklahoma.

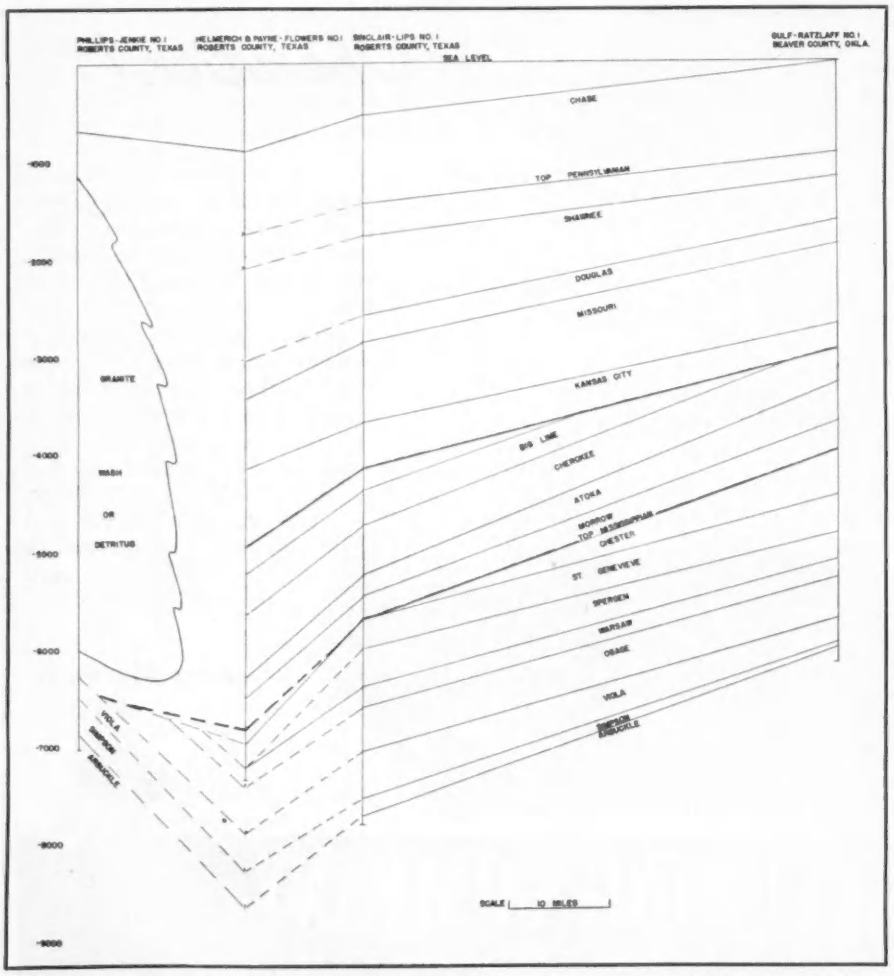


FIGURE 4. North-south geological cross-section B-B' from Beaver County, Oklahoma, to Roberts County, Texas.

problems involved are due to surface rather than subsurface conditions. The presence over a large part of the area of reworked Tertiary material or beds of gypsum appears to prevent the recording of usable reflections, even with very deep shot holes. A number of interfaces exist within the geologic section here, with reflection coefficients sufficient to produce good reflections. In the past few years, at least two major companies have spent considerable time in the area experimenting with various techniques in an attempt to solve this problem.

Within the past three years a new seismic technique has been introduced which may offer some hope for a solution of this problem. This is the air-shooting technique developed and patented by Dr. Thomas C. Poulter. While there are undoubtedly some local areas where this method could not be used in the Western Anadarko Basin, in general, record quality seems to be definitely improved over that obtained using shot holes. By sufficient experimentation with the method, many of the exceptional areas could possibly be worked successfully. The weathering problem associated with the use of the method can be handled satisfactorily.[1]

Recently it was found that a considerable reduction in the charge may be made without impairing record quality. This, of course, helps to reduce such damage claims as may arise from using the method.

Figure 2 shows an air record obtained in Beaver County, Oklahoma, using a charge of 35 pounds. It was possible to carry several of the indicated reflections over a fairly large area. This permitted the use of time isopachs which eliminated minor variations in the calculated weathering.

A recommendation is made that further experimentation be carried out using the Poulter Method with multiple geophones, variable patterns, variable charges, variable spacing, etc., in order to determine the technique best suited for each particular area. Such a procedure would most certainly be justified for almost any part of the area under discussion. Admittedly, the Poulter Method is still in its infancy as an exploration tool compared with most other geophysical methods, but at least an attempt should be made to use it in those areas where it has shown promise, as in the Western Anadarko Basin.

REFERENCE

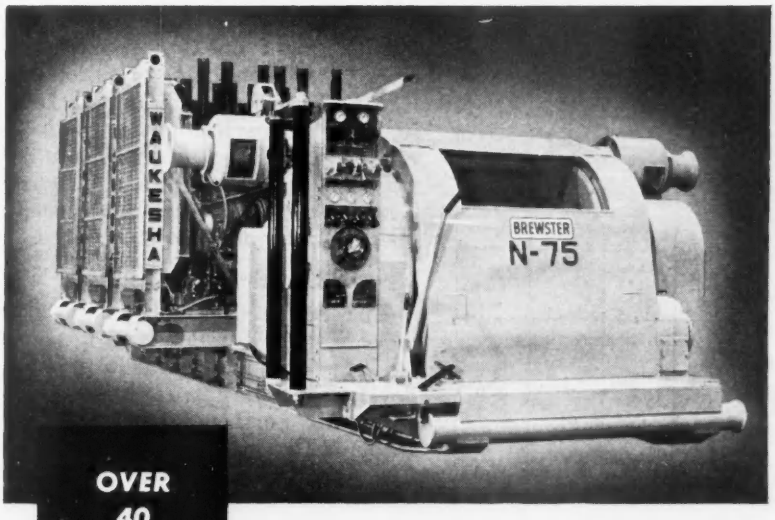
[1] Clayton, Neal, "Weathering and Other Surface Shooting Problems," WORLD OIL, March, 1951, pp. 57-58.

"Our New Brewster N-75 Is what we've been Looking for"

Frank Garret,
Drilling Superintendent

Frank Garrett, drilling superintendent and Tommy Reynolds, tool pusher, Cactus Drilling Company, are on the second well with their new Brewster N-75 drawworks.

They say that it is the rig they have been looking for—one that will drill to 10,000 feet and still make hole as fast and operate as smoothly as their Brewster N-7.



Tommy Reynolds
Toolpusher

OVER 40 YEARS EXPERIENCE

Brewster's new N-75 drawworks is the rig you are looking for. You'll like the 700 horsepower, the larger diameter and greater length of drum core—the heavy-duty chains on high and low drum drives—the auxiliary positive clutch which is built into the low drum friction clutch.

You'll find that the N-75 can take a lot of hard use and will give you years of low cost drilling.

Let us tell you about the new N-75.

Write today for the new Brewster catalog, giving full details on Brewster Drilling Equipment, Drawworks, Blocks, Swivels and Rotaries.

SUPPLY COMPANIES

Apex Equipment Company
Bovaird Supply Company
Industrial Supply Company
Murray Brooks, Inc.
Reams Supply Company

In Canada: Rocky Mountain Supply Co. Direct and through recognized export dealers.

Manufacturers of Fine Drilling Equipment ... Since 1910

BREWSTER DRILLING EQUIPMENT

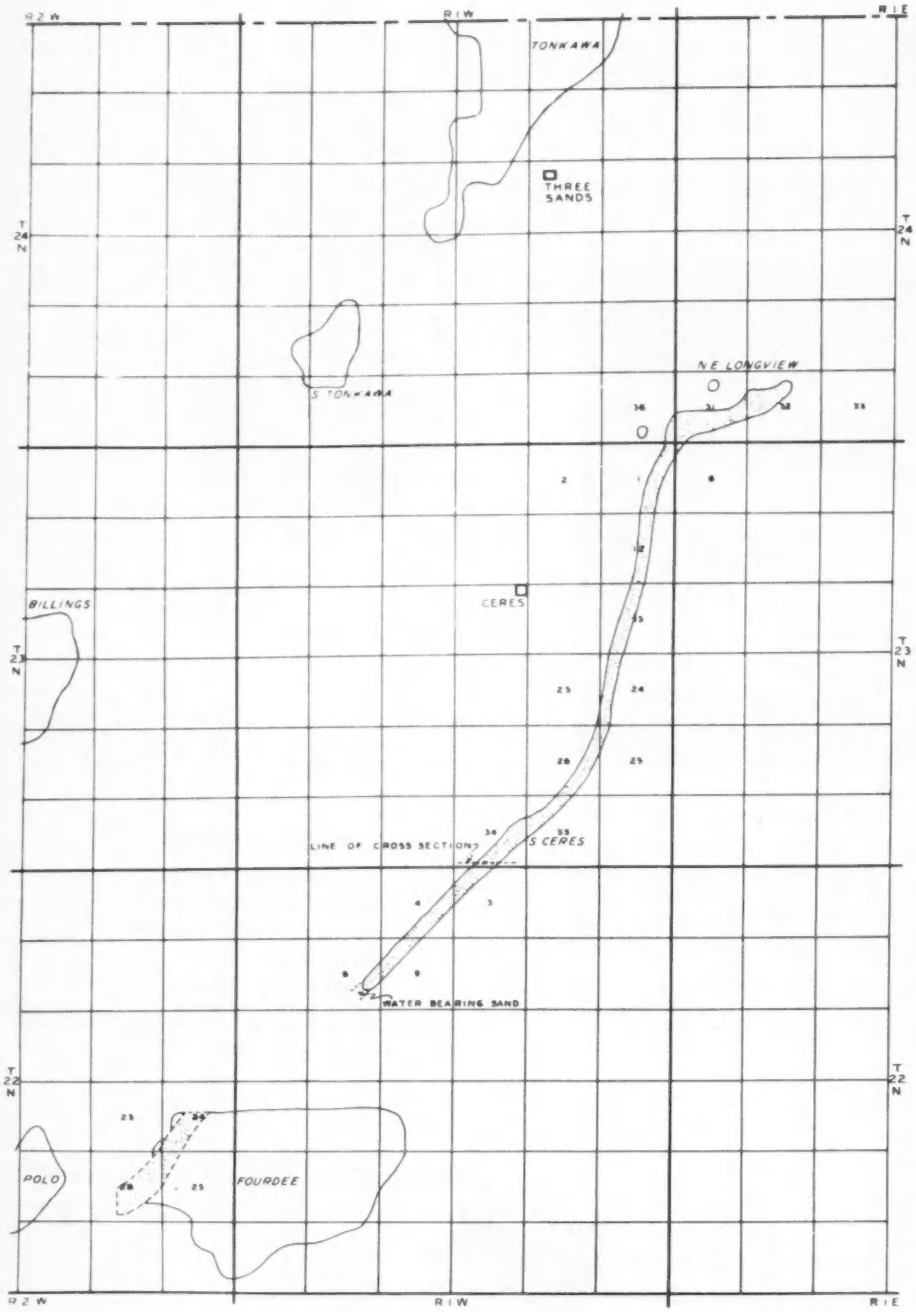
THE BREWSTER COMPANY, INC., SHREVEPORT, LA.

South Ceres

Oklahoma's Oddest Shoestring Field

By E. P. NEAL
Tide Water Associated Oil Company, Tulsa

SOUTH CERES shoestring field, Noble County, north central Oklahoma, 10½ miles long and 1000 feet wide, could be the forerunner of additional fields of this peculiar type in the surrounding region. The field is a tight shoestring sand, indicative of shoreline occurrences that heretofore have had little significance in oil prospecting in this section, although have been known and successfully exploited in Kansas. This is a preliminary paper, published by permission of the American Association of Petroleum Geologists. Complete paper will be published in the AAPG Bulletin.



Map showing location of South Ceres, Northeast Longview, and Fourdee shoestring sandbars.

THE South Ceres shoestring field, Noble County, is one of the oddest fields of its type in Oklahoma, because of its extremely narrow and uniform width, averaging about 1000 feet, as compared with its relatively great and continuous length of 10½ miles. The south part of the field trends northeast-southwest in a straight line for four miles. Then the field trends northward, following a fairly straight line for another four miles. The producing formation is a Red Fork sand lense in the Cherokee shales of Pennsylvanian age. It has a relatively flat base, a convex top, and steep sides which grade rather abruptly into shales, the usual characteristics of an offshore sand bar.

Location and History

The South Ceres shoestring field is more than 40 miles from the nearest large producing oil field presently developed in the Cherokee sandstones. It trends northeast from 8-22n-1w through 23n-1w into Sec's. 31 and 32 24n-1e. This field is ten miles north of Perry in north central Noble County, between the Polo-Fourdee area on the south and the Tonkawa field on the north. It is about 40 miles southwest of the large Burbank field in western Osage County, and about 125 miles south-southwest of the prolific and peculiarly shaped shoestring sand fields in four counties centering around Greenwood County in southeastern Kansas.

The South Ceres field was discovered in January, 1947, by C. C. Harwell and associates' Greer 1, drilled in the southwest corner of 24-23n-1w. The test was given financial support by Stanolind Oil & Gas Company and Frank Buttram of Oklahoma City. The presence of the shoestring sand bar at this locality was not suspected.

The operators state that the dis-

WE DO THE *spadework..*

THE thorough-going procedures of the field crews, the competency of the party chiefs, and the extensive professional experience of *every* key member of the Independent organization is the foundation on which a long list of oil producers have been building successful geophysical exploration programs for 18 years. The success of your own quest for new oil reserves depends on how well the spadework is done. It will pay you to consult with Independent about your next survey project.

N. N. Zirbel graduated from Rice Institute and started to work with Independent 18 years ago. He went through the mill learning thoroughly the function of every man on a survey party before becoming a party chief. Only men with such extensive training and field background hold posts of responsibility with Independent.

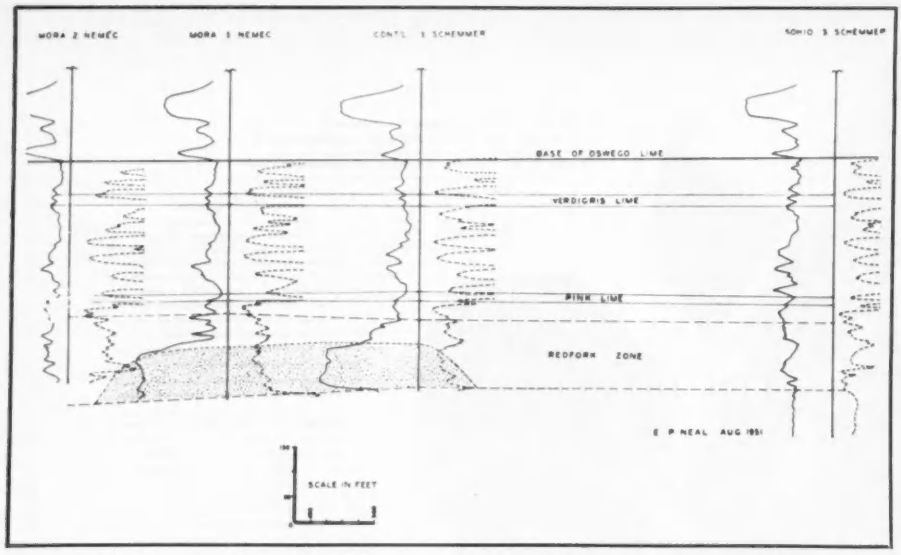
POINTING THE WAY IXC FOR THE DRILL

Independent *Geophysical Surveys*

EXPLORATION COMPANY

1973 WEST GRAY ★ HOUSTON, TEXAS

ESTABLISHED 1932



East-west cross-section diagonally across the South Ceres sandbar in 34-23n-1w.

covery well of the South Ceres field was located on the basis of a slight nose in the surface rocks. The surface rocks in this area belong to the Wellington Group in the upper part of the Wichita-Albany Series of Lower Permian age. The outcrops strike generally north and south and the beds dip westward.

Subsurface Geology

STRATIGRAPHY: The Permian System is represented by approximately 1250 feet of sediments in the Wellington and Chase Groups.

The Pennsylvanian System includes the Virgil, Missouri and Des Moines Series. The Virgil Series includes the Wabaunsee, Shawnee and Douglas Groups which have a total thickness of approximately 1600 feet. The Missouri Series includes the Lansing and Kansas City Groups which have a total thickness of approximately 1000 feet. The Des Moines Series includes the Marmaton and Cherokee Groups which have a total thickness of approximately 650 feet. The Cherokee Group, which includes the well-known Prue, Skinner, Red Fork and Bartlesville sands, has a total thickness of approximately 375 feet. In the South Ceres-Northeast Longview area the Prue sandstone is either poorly developed or absent and the Bartlesville sandstone is not present in any of the wells. The Cherokee formations thin westward and northwestward in this area. The Verdigris limestone, Pink limestone and Inola limestone are excellent markers for use in correlating the beds in the Cherokee Group. The total thickness of sediments in the Pennsylvanian System in this area is approximately 3250 feet. The pre-Cherokee formations of the Pennsylvanian are not represented in this area.

The Mississippian System, unconformably underlying the Pennsylvanian, is represented by approximately 300 feet of the Mississippi lime and approximately 50 feet of Woodford shale. These formations are in the Osage and Kinderhook Series. The Upper Mississippian Chester and Meramec Series are absent in this area. The Mississippi lime is the main producing formation in the Fourdee field, about two miles south of South Ceres.

The Hunton lime, comprised of the Devonian and Silurian Systems, is absent in this area and the Ordovician System occurs unconformably below the Mississippian. The Sylvan shale, which normally occurs at the top of the Ordovician, is absent. The Viola limestone is 50 feet or less in thickness. The Simpson Group which contains the Bromide-Wilcox sandstone and the Tyner-Bergen sandstone has a total thickness in this area of approximately 300 feet. The First Wilcox sandstone is present but it pinches out to the north in Twp. 24n. The Second Wilcox sandstone is about 100 feet thick. The Arbuckle limestone has a thickness of approximately 1000 feet resting on pre-Cambrian granite unless separated by erratic occurrences of Reagan sandstone.

STRUCTURE: The South Ceres shoestring was deposited in an area where the Cherokee sea was generally very shallow and contained many channels, shoals, lagoons and bays. The main expanse and deeper portion of the Cherokee sea was eastward and southeastward from Noble County. The Cherokee formations have since been slightly folded and tilted, developing the present regional dip of more than 20 feet per mile southwestward. Structurally the Pink limestone, just above the Red Fork sandstone, forms a narrow anticlinal ridge with a few slight, elongated closures over the South Ceres sand bar. This arching is generally considered to be a result of differential compaction, but a large percentage of this arching is believed by the writer to be of depositional origin. In eastern Kansas, where the Cherokee sandstones are found at relatively shallow depths, some geologists claim they mapped this arching of the beds in the surface rocks and located the sand bars and extensions in this manner. The few available data suggest that the interval between the Pink limestone and the base of the Pennsylvanian thins slightly under the sand bar. The irregularity of the surface on which the Pink limestone was deposited is believed to be a considerably greater factor in the arching of the Pink limestone over the sand bar than the compaction of the shales and muds.

Reservoir Geology

Stratigraphically, the South Ceres (Red Fork) shoestring sand, is below the Pink limestone and above the Inola limestone. The South Ceres shoestring sand bar averages approximately 1000 feet in width and is producing continuously for a distance of 10½ miles. The reservoir is defined on the south by salt water in the sand. The north end of the South Ceres shoestring has been found to be continuous with the Northeast Longview field where the sand body has lost its narrow shape and has become more silty, but has maintained thicknesses up to 63 feet. The north extremity of the field has not been defined to the north, east or west.

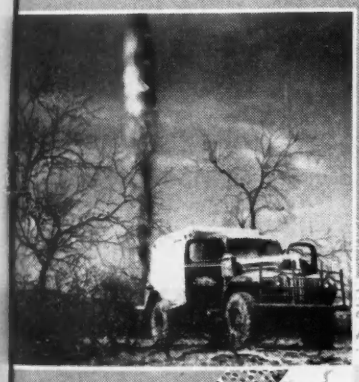
The average depth to the producing sand is about 4475 feet. The approximate area and volume of the reservoir

TABLE 1

$\frac{10\frac{1}{2}\text{ (Length Miles)} \times 5280\text{ (Feet)} \times 1000\text{ (Avge. Width Feet)}}{43{,}560\text{ (Sq. Ft. per Acre)}} = 1273\text{ Producing Acres}$
1273 (Prod. Acres) x 25 (Avge. Thickness Feet) = 31,825 Acre Feet of Sand
$\frac{1273\text{ (Prod. Acres)}}{90\text{ (Wells)}} = 14.1\text{ Acres per Well}$

Century

PAVES THE HIGHWAY FOR DRILLING



Authentic subsurface data, accurately interpreted, is the purpose of seismic surveying. This information is being gathered today throughout the United States and Canada by Century for many major and independent operators. Superior field techniques, precision instruments and complete knowledge of the needs of its customers have made Century one of the leaders in the surveying industry.

Century **GEOPHYSICAL CORPORATION**

TULSA, OKLAHOMA

EXPORT OFFICE:
149 Broadway, New York

615 8th Avenue West
Calgary, Alta., Canada

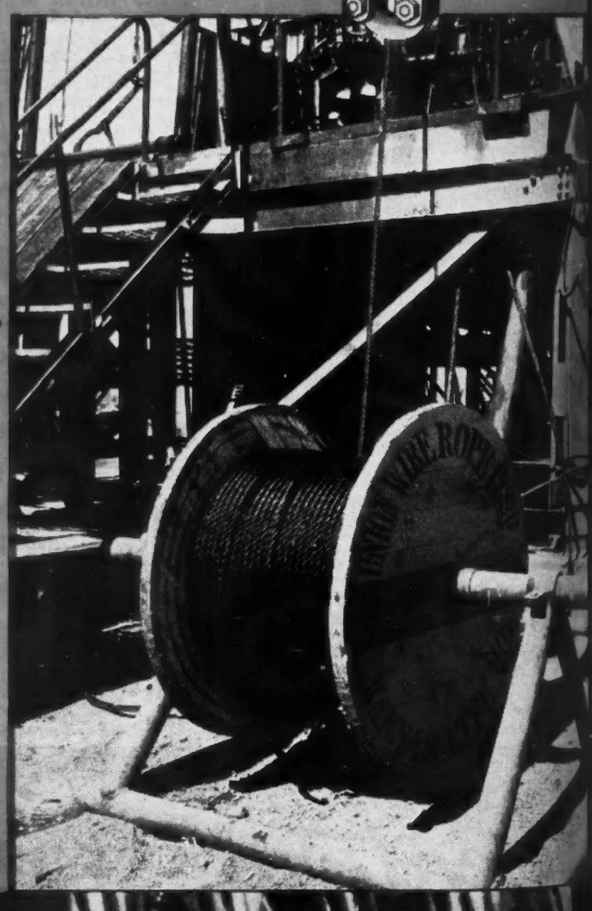
On Either Standard or Jackknife Rigs

YOU GET MORE ROUND TRIPS

with

Tuffy®

ROTARY LINE



This is not merely a manufacturer's claim. It is backed up by field tests of Tuffy Rotary Line on both standard and jackknife rigs. To make these tests, Union Engineers worked closely with drillers in the field.

The Tuffy Rotary Line is made of special steels and employs a unique construction. It has higher resistance to abrasion, shock loads, drum crushing and internal friction. These are the things that cause early rope fatigue.

On jackknife rigs, Tuffy ***Jackknife*** Rotary Line spools and reeves better and operates at higher speeds over the smaller sheaves and drums of the jackknife rig.

Tuffy ***Standard*** Rotary Line is designed for use with a standard rotary rig. It will give you maximum performance and more round trips. It is also easy to cut, when necessary, and spools well. For deeper drilling with jackknife rigs, Tuffy ***Standard*** Rotary Line is recommended.

Easy To Order

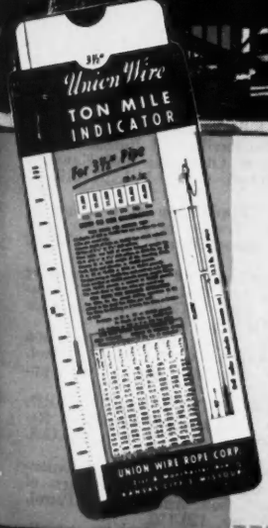
When you order Tuffy Rotary Line, you do not have to remember complicated specifications. Just give size, length and whether Tuffy **Jackknife** or Tuffy **Standard**.

Lower Wire Rope Costs By Measuring The Work Your Drilling Line Does

Now Union gives drillers a way to measure the drilling line service for the purpose of establishing the correct time for line cutting. When you know this, you can prevent cutting the line too soon or over-loading, either of which lowers ton mileage. And it will aid you in avoiding more line breaks and costly fishing operations. By measuring ton-mileage, you can make a much better showing in drilling performance.

Mail This Coupon To Have Your Ton-Mile Indicator Delivered To You

A Union field representative will bring you your free ton-mile indicator and show you how easy it is to use. He will also give you a handy Union Log Book. The indicator does all the complicated figuring for you. Merely set the figures from your log book on the indicator and read the answer. Mail the coupon today.



union Wire Rope

UNION WIRE ROPE CORPORATION

2104 Manchester Ave. Kansas City 3, Mo.

Gentlemen: Please have a Union field representative deliver my Union Ton-Mile Indicator and Log Book and explain its use.

*Name*_____

*Address*_____

*City*_____ *Zone*___ *State*_____

Exploration 22.4 Percent Ahead of 1950 Period

A TOTAL of 939 exploratory tests were completed in the U. S. during October to boost the year's ten-month total into a 22.4 percent lead over those drilled in the comparable period of 1950. Already a new all-time record in exploratory drilling has been set, there having been a few more wells completed in ten months of this year than were drilled in all of last year, which was the most active period in history.

Of October's tests, 147 were completed as producers, and they amounted to 15.7 percent of the total wells completed. A month earlier a somewhat better score was made as 177 producers accounted for 17.4 percent of the total. Even that was below par, because for the year so far 18 percent of tests drilled have been productive. The year's 18 percent is not impressive, for a year ago the count had been 19.5 percent successful, and even that was slightly below previous years' standards.

In ten months the completed exploratory wells stood at 8758. That was a gain of 22.4 percent over the 7153 completed last year by the same time.

Summary of Results of Exploratory Drilling

ITEM	Oct., 1951	Sept., 1951	TEN MONTHS January-October 1951	1950	Percent Diff.
Oil Discoveries	102	119	1,088	914	+ 19.0
New Fields	82	78	801	676	+ 18.5
New Pays	20	41	287	238	+ 20.6
Distillate Discoveries	6	7	69	75	— 8.0
New Fields	2	5	45	58	— 22.4
New Pays	4	2	24	17	+ 41.2
Gas Discoveries	17	22	178	124	+ 43.5
New Fields	14	15	140	109	+ 28.4
New Pays	3	7	38	15	+153.3
Total Discoveries	125	148	1,335	1,113	+ 19.9
Extensions to Fields	22	29	245	279	— 12.9
Oil Fields	17	21	191	246	— 22.4
Distillate Fields	.....	2	14	9	+ 55.6
Gas Fields	5	6	40	24	+ 66.7
Total Prod. Tests	147	177	1,580	1,392	+ 13.5
Dry Holes	792	843	7,178	5,761	+ 24.6
Wildcats	759	824	6,859	5,535	+ 23.9
New Pays	1	1	12	8	+ 50.0
Outposts	32	18	307	218	+ 40.8
Total Expl'tory Tests	939	1,020	8,758	7,153	+ 22.4
Percent Productive	15.7	17.4	18.0	19.5	.....
Percent Dry	84.3	82.6	82.0	80.5	.....

Results of Exploratory Drilling in October and First 10 Months, 1951-1950 by Districts

State or District	MONTH OF OCTOBER, 1951													FIRST TEN MONTHS, 1951																	
	Productive Tests										Unproductive Tests				Productive Tests									Unproductive Tests			Total Dry		Total Exploratory Tests	
	New Fields			New Pays			Extensions			Total Productive				Total Exploratory Tests	New Fields			New Pays			Extensions			Total Productive							
	Oil	Dis.	Gas	Oil	Dis.	Gas	Oil	Dis.	Gas		Wildcats	New Pays	Outposts		Oil	Dis.	Gas	Oil	Dis.	Gas	Oil	Dis.	Gas	10 Mo. 1951	10 Mo. 1950	Wildcats	New Pays	Outposts	10 Mo. 1951	10 Mo. 1950	10 Mo. 1951	10 Mo. 1950
Alabama											2		1	3				1			2			3	2	18		1	19	16	22	18
Arizona																										3			3	5	3	5
Arkansas				1						1	5			6	4		1	9	1		3			18	9	72		8	80	72	98	81
California	5			1			3			9	36		5	50	27		2	22			13		3	67	43	364	4	35	403	316	470	359
Colorado	1									1	13			14	6		3			1				10	8	99		3	102	44	112	52
Florida																										3			3	8	3	8
Georgia																														4		4
Idaho																										1			1	4	1	4
Illinois	7			2		2	3			14	68			82	30			17		2	40			89	97	619			619	588	708	685
Indiana	3			1						4	48			52	34			10		1	2			47	47	341		1	342	397	389	444
Kansas	8			1						9	65			74	124		7	23						154	93	666			666	513	820	606
Kentucky	1									1	15			16	14			7			7			28	17	159			159	83	187	100
Louisiana	2	1			1					4	33		1	38	28	6	4	15	4	4	12	1	1	75	80	278	1	19	298	199	373	279
North Louisiana											18		1	19	15	1		4	1	4	6	1	1	33	27	178	1	9	188	100	221	127
South Louisiana	2	1			1					4	15			19	13	5	4	11	3		6			42	53	100		10	110	99	152	152
Maryland																									1					3		4
Michigan											36			36	9		4	1		1	1			16	36	267			267	246	283	282
Mississippi	4				1					5	17		2	24	11	2		4	2		1			20	14	121		10	131	120	151	134
Missouri																										1			1	6	1	6
Montana											6			6	1						4			5	3	40	1	5	46	47	51	50
Nebraska	3		1							4	12		1	17	10		1	1			2		4	18	11	67		6	73	48	91	59
Nevada																										2			2		2	
New Mexico							1		1	2	9	1		12	13		9	4			3		2	31	26	63	1	7	71	64	102	90
New York																																
North Dakota											1			1	1									1		7			7		8	
Ohio			1							1	2			3			1				1		4	6	4	22			22	13	28	17
Oklahoma	10	1	1	1			1			14	60			74	65	3	8	20	2	1	28	2	2	131	138	551			551	435	682	573
Oregon																																
Pennsylvania																	1							1	1						1	1
South Dakota																														6		6
Tennessee																										6			6	4	6	4
Texas	38		10	12	2	1	9		4	76	316		21	413	414	34	95	142	15	27	66	11	24	828	731	2971	5	197	3173	2412	4001	3143
Dist. 1 S. Central	1									1	19		1	21	18		4	2		1	5		1	31	20	175		13	188	166	219	186
Dist. 2 Middle Gulf	1		1						2	4	19		3	26	11	10	12	20	3	10	5	3	9	83	61	178	1	30	209	143	292	204
Dist. 3 Upper Gulf			4	4						8	21		3	32	19	9	24	29	2	3	2	1	2	91	93	226		7	233	202	324	295
Dist. 4 L. Gulf-S.W.	1			3	1				1	6	34		3	43	23	6	19	32	7	9	7	1	8	112	88	302	1	30	333	239	445	327
Dist. 5 E. Central			1							1	11		1	13	5	2	1	6			7			21	9	127		3	130	59	151	68
Dist. 6 Northeast				1	1					2	13			15	6	4	1	3	1		1	6		22	21	79		3	82	72	104	93
Dist. 7-B N. Cent.	17		1			1				19	72			91	152		21	14		2	4		2	195	167	815		13	828	528	1023	695
Dist. 7-C W. Cent.	4		2	1						7	29		1	37	48	1	5	6	2		6			68	44	254		7	261	189	329	233
Dist. 8 West	6						6			12	34			46	53		4	13			16			86	111	308	3	13	324	260	410	371
Dist. 9 North	8		1	3			3			15	62		9	86	76	2	2	17		2	13		1	113	116	478		77	555	545	668	661
Dist. 10 Panhandle									1	1	2			3	3		2						1	6	1	29		1	30	9	36	10
Utah											2			2	2									2	2	21			21	13	23	15
Washington																														2		2
West Virginia																	2							2		2			2		4	
Wyoming			1	1						2	13		1	16	8		2	11		1	6			28	29	95		15	110	93	138	122
Total U. S.	82	2	14	20	4	3	17		5	147	759	1	32	939	801	45	140	287	24	38	191	14	40	1580	1392	6859	12	307	7178	5761	8758	7153

Here's a Record that's Hard to Beat—

PICKRELL DRILLING COMPANY, INC.
Drilling Contractors • Oil Producers
FOURTH NATIONAL BANK BLDG.
WICHITA 2, KANSAS
September 20, 1951

Diesel Equipment Company, Inc.,
355 North Washington,
Wichita, Kansas.

Attention: J. D. Jarvis, President.

Dear Jim:

A recent analysis of our drilling cost operations gave us some interesting information on the operation costs of the General Motors, Series 71, Twin diesel engines which power each of our Unit Rig Company U-15 drawworks and 7¼" X 12" Gardner-Denver mud pumps.

Our two General Motors, Series 71 Twins have drilled a total footage of 405,591 feet in 1408 operating days, operating approximately 31,680 hours. Total engine maintenance costs, which include all repairs and mechanics' time and transportation, for this period was $6,283.28. Our maintenance cost on these engines has been approximately 1½c per foot of hole drilled; the exact figure is $0.01549 per foot. Incidentally the above cost figures include a major overhaul for the engines on our oldest rig. Fuel consumption averages 10.6 gallons per hour per twin engine and our fuel cost has averaged approximately 13c per gallon.

All service and repair work has been performed by your Company's Great Bend branch. Our Mr. Cecil Burton, drilling superintendent, attributes a large part of the successful and low cost performance of these engines to the attention given them by your service men. Their instruction and advice to our drillers has enabled our crews to operate these engines in a most efficient manner.

We are highly pleased with the trouble free and economical operation of these G.M. Twin diesel engines and do not hesitate to recommend them to other drilling contractors.

With every good wish for your continued success, we are

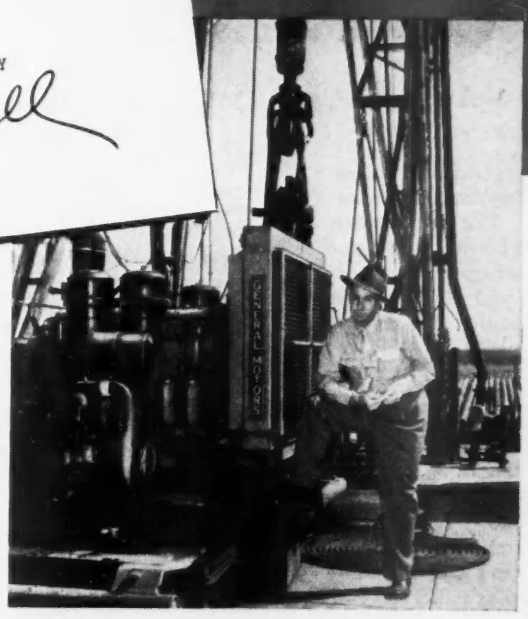
Very truly yours.

PICKRELL DRILLING COMPANY

Lloyd R. Pickrell

Lloyd R. Pickrell

LRP:ez



Here's convincing proof that General Motors Diesel engines cost less to maintain. It's one of the reasons this modern, 2-cycle Diesel power is the favorite of drilling contractors everywhere. Find out how much more GM Diesels have to offer. See your nearest distributor or drop us a line.

GM GENERAL MOTORS DIESEL POWER

DETROIT DIESEL ENGINE DIVISION

SINGLE ENGINES . . . Up to 275 H.P. **DETROIT 28, MICHIGAN** MULTIPLE UNITS . . . Up to 800 H.P.

GENERAL MOTORS

DIESEL BRAWN WITHOUT THE BULK

ANSWER THE CALL CIVIL DEFENSE

U. S. Oil, Distillate and Gas Discoveries and Extensions in October

ARKANSAS—NEW OIL PAY

Ouachita County, Pace City field. Lion Oil Company's Solomon 3, C NE NW SE 25-15s-18w, flowed 105 barrels from Travis Peak sand, Cretaceous 3000-05 feet, 27-gravity, 12/64-inch, completed 10-26-51, TD 3305.

CALIFORNIA—NEW OIL FIELDS

Kern County. E. A. Bender, M. H. Stansbury & Del Webb's Anderson 1, in 15-30s-21e, flowed 140 barrels from Phacoides sand, Miocene 4605-30 feet, 33-gravity, 20/64-inch, completed 10-21-51, TD 5011.

Unnamed field. California Exploration Company & MacMillan Petroleum Company's Clerico 28-6, in 28-30s-29e, flowed 211 barrels from Chanac, Sta. Margarita & Porter sand, Upper Miocene, 22.2-gravity, 11/64-inch, completed 10-6-51, TD 5175.

Unnamed field. Glenn C. Ferguson & I. W. Bosworth's Richardson 1, in 18-29s-21e, pumped 25 barrels from Lower Miocene sand, Miocene 838-1288 feet, 15-gravity, completed 10-26-51, TD 1400.

Unnamed field. Humble Oil & Refining Company's Rosedale-Stevens Commission 1, in 15-29s-26e, flowed 273 barrels from Stevens sand, Upper Miocene 5890-5955 feet, 31.5-gravity, 3/16-inch, completed 9-24-51, TD 7321.

Santa Barbara County. Richfield Oil Corporation's Russell 42-6-A, in 6-10n-27w, pumped 50 barrels from Sta. Margarita sand, Miocene 1051-1107 feet, 23.6-gravity, completed 10-26-51, TD 4520.

CALIFORNIA—NEW OIL PAY

Orange County, Huntington Beach field. Charles S. Black's Black Oil 1 (OW-DD), in 26-6s-11w, pumped 10 barrels from 3557-3922 feet, completed 10-4-51, TD 5400.

CALIFORNIA—OIL FIELD EXTENSIONS

Fresno County, Camden field. Universal Consolidated Oil Company's McVicar 18-5, in 5-17s-20e, ½-mile northwest extension, pumped 40 barrels from 6117-22 feet, 33-gravity, completed 10-12-51, TD 6250.

Kern County, Fruitvale, Southwest field. Stansbury, Incorporated's Well 56-28, in 28-29s-27e, ½-mile southwest extension, pumped 56 barrels from 4217-4301 feet, 23-gravity, completed 10-21-51, TD 4301.

Kern County, Jasmine field. Pacific Oil & Gas Development Corporation's Cantleberry 82-A, in 22-25s-27e, ½-mile northeast extension, pumped 75 barrels from 2708-52 feet, 15-gravity, completed 10-14-51, TD 2752.

COLORADO—NEW OIL FIELD

Logan County, "Sand Creek Ranch" field. Sinclair Oil & Gas Company's Phillips 1, NE NW SW 19-7n-54w, flowed 324 barrels from "D" sand, Upper Cretaceous 5116-25 feet, 36-gravity, completed 10-25-51, TD 5145.

ILLINOIS—NEW OIL FIELDS

Clay County, Noble, West field. J. H. Gilliam Drilling Company's C. Jones 1, NE SE NW 3-3n-8e, pumped 42 barrels from Rosiclare lime, Mississippian 3036-42 feet, completed 10-9-51, TD 3143.

Gallatin County, Omaha, South field. Inland Producer's Allen 1, SE NW SW 8-8s-8e, pumped 34 barrels oil and 30 barrels water from Rosiclare lime, Mississippian 2866-68 feet, completed 10-9-51, TD 3017.

Jefferson County, Irvington, East field. Ervin & Bassett's Hartley 2, SW 19-1s-1e, pumped 24 barrels from Pennsylvania sand, Pennsylvanian 1030-45 feet, completed 10-23-51, TD 1084.

Lynchburg field. Peak Drilling Company's Brown 1, SE SE NW 8-3s-4e, pumped 175 barrels from McClosky lime, Mississippian 3050-60 feet, completed 10-23-51, TD 3065.

Saline County, Broughton, South field. Skiles Oil Corporation's M. Pemberton 1, NW NW SW 20-7s-7e, pumped 28 barrels oil and 30 barrels water from McClosky lime, Mississippian 3213-17 feet, completed 10-2-51, TD 3227.

Washington County, Beaucoup, South field. Dale Hopkin's Kruski 1, NE NE SE 33-2s-2w, pumped 103 barrels oil and 4 barrels water from Bethel sand, Mississippian 1430-37 feet, completed 10-30-51, TD 1445.

White County, Phillipstown, South field.

RED DEVIL

"DIA-HARD" LINERS

For high pressure abrasive service

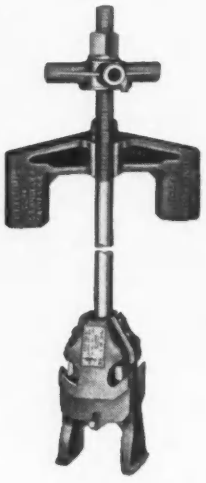
Forged in one piece from highest quality alloy steel. The deep HIGH-CARBON wear resistant case of maximum hardness and uniformity is obtainable only by our SPECIAL "DIA-HARD" PROCESS, greatly excelling all other known methods for longer life liners. The bore is PRECISION HONED, and ACCURATE OUTSIDE DIMENSIONS insure a perfect working fit with liner packing assembly and pump cylinder for positive leakproof sealing. Write for Catalog No. P-120.

TELL-TALE LINER PACKING ASSEMBLIES

Gives warning before damage

Tell-Tale Liner Packing Assembly consists of two "DIA-TEX" oil and heat resistant sealing rings separated by a precision made steel, corrosion-resistant lantern ring. Internal leakage is detected instantly in slush pumps through "tell-tale holes" before costly fluid cuts occur to cylinder walls. There is either a Tell-Tale Liner Packing Assembly or a "DIA-TEX" Sealing Ring available for all makes of slush pumps. Write for Catalog No. P-121.

LINER PULLERS



Save valuable time and labor

The Red Devil Liner Puller is a strong, heavy duty, dependable tool capable of pulling the most obstinate liner. Its operation is simple. There are no pins, connecting links or other small parts to bend, shear, break or become lost.

The "Universal Type" Puller (as illustrated) is designed for slush pumps. The "Expanding Grip Type" is designed for pulling thin wall-driven tube type liners, as used in small pumps. Write for Catalog No. P-122.

See Composite Catalog . . .
For more detailed information on Red Devil Products, see the Composite Catalog or write for special price catalogs noted above. Red Devil products are available through your supply store.

OIL WELL MANUFACTURING CORP.
6008 S. Alameda St., Los Angeles 1, Calif.

FOREMOST

IN THE

GEOPHYSICAL

FIELD

DOMESTIC OPERATIONS

Western

GEOPHYSICAL COMPANY
OF AMERICA

FOREIGN OPERATIONS

Western

GEOPHYSICAL COMPANY
INTERNATIONAL

Henry Salvatori, President

PACIFIC MUTUAL BUILDING, LOS ANGELES 14, CALIFORNIA

SHREVEPORT, LOUISIANA • MIDLAND, TEXAS • CASPER, WYOMING
CALGARY, ALBERTA, CANADA • MILAN, ITALY • SAN JOSE, COSTA RICA

Aubrey-Tennant Oil Company's J. L. Brown 1, NW SW SW 11-5s-10e, pumped 30 barrels oil and 5 barrels water from Aux Vases sand, Mississippian 2981-91 feet, completed 10-30-51, TD 2994.

ILLINOIS—NEW OIL PAYS

Effingham County, Bason, North field. The Texas Company's R. Sinnickson 2, SW SW NW 10-6n-5e, pumped 100 barrels oil and 30 barrels water from Bethel sand, Mississippian 2247-59 feet, completed 10-2-51, TD 2504.

Marion County, Raccoon Lake field. The Texas Company's C. Langenfeld 10, NW SE 3-1n-1e, pumped 109 barrels oil and 101 barrels water from Devonian lime, Devonian 3256-3325 feet, completed 10-23-51, TD 3385.

ILLINOIS—OIL FIELD EXTENSIONS

Clay County, Hord, South field. Herman S. Graham's W. McGee 1, S½ SE NE 27-5n-6e, ½-mile northwest extension, pumped 460 barrels oil and 5 barrels water from McClosky lime, Mississippian 2775-80 feet, completed 10-23-51, TD 2781.

Cumberland County, Hidalgo, North field. Kull Oil Company's Clark 1, SE SW SW 25-9n-9e, ¾-mile north extension, pumped 6 barrels from Rosiclare sand, Mississippian 2660-73 feet, completed 10-2-51, TD 2704.

Effingham County, Iola Consolidated field. D. H. Bolin's Hetzel 1, SW SW NE 33-6n-5e, ¾-mile extension, pumped 20 barrels oil and 40 barrels water from McClosky lime, Mississippian 2488-92 feet, completed 10-9-51, TD 2498.

ILLINOIS—NEW GAS PAYS

Fayette County, Louden field. Carter Oil Company's J. Drees 1-G, SE NW 22-8n-3e, flowed 0.2-million from Tar Springs sand, Mississippian 1103-07 feet, completed 10-30-51, TD 1107.

White County, Herald field. A. J. Slagter, Junior's Bayley 1, SW NW 2-7s-9e, flowed 1.6-million from Pennsylvania sand, Pennsylvanian 694-700 feet, completed 10-30-51, TD 700.

INDIANA—NEW OIL FIELDS

Daviess County. Edison-Gwaltney Drilling Company's Allison Heirs 1, in 26-2n-7w, pumped 40 barrels from Aux Vases lime, Mississippian 1063-65 feet, TD 1065.

Gibson County. National Association Petroleum Company's Daniel B. Davidson 1, in 8-1n-10w, pumped 20 barrels from Aux Vases lime, Mississippian 1672-74 feet, TD 1674.

Vanderburgh County, Belknap, East field. Indiana Farm Bureau Co-op Association, Incorporated's John M. Phillips Community 1, SW NW SW 16-6s-11w, pumped 107 barrels from Biehl sand, Pennsylvanian 1520-29 feet, TD 1529.

INDIANA—NEW OIL PAY

Dubois County, Birdseye field. Kingwood Oil Company's Eva Boeckman et al 1, SE NW SE 15-3s-3w, pumped 27 barrels oil and 23 barrels water from Salem & Warsaw lime, Mississippian 1172-1328 feet, TD 2305.

KENTUCKY—NEW OIL FIELD

Henderson County. Nash Redwine & A. G. Amadio et al's George D. Heppler 1, NE NW SW 14-Q-27, pumped 12 barrels oil and 60 barrels water from O'Hara & McClosky lime, Mississippian 1885-1922 feet, TD 1926.

KANSAS—NEW OIL FIELDS

Butler County, Brickley field. Dunne & Strait's Lanier 1, SE NW NW 2-27s-7e, pumped 25 barrels from Bartlesville sand, Pennsylvanian 2666-85 feet, TD 2685.

Ellis County. Anschutz Drilling Company & Elreco Refining Company's Braun 1, SW NE NE 34-13s-17w, pumped 228 barrels from Arbuckle lime, Ordovician 3478-94 feet, TD 3494.

Ubert, North field. G-M-R Oil Company's Staab 1, SW SW SW 31-12s-17w, pumped 232 barrels from Arbuckle lime, Ordovician 3599-3613 feet, TD 3613.

Phillips County. Cooperative Refining Association's Beckman 1-A, SW SW SE 3-4s-19w, pumped 22 barrels from Lansing-KC lime, Pennsylvanian 3201-08 feet, TD 3503.

Rooks County, Elm Creek field. V. D. Sidey's Stamper 1, SW SW NE 19-8n-17w, pumped 277 barrels from Arbuckle lime, Ordovician 3397-3402 feet, TD 3402.

Palco, Southwest field. Brooks Hall's Holmes 1, SE SE NW 7-10s-20w, pumped 464 barrels from Arbuckle lime, Ordovician 3859-61 feet, TD 3861.

Stafford County, Curtis, South field. Westgate-Greenland Oil Company's Roach-Wilson 1, NE NW SE 12-22n-14w, pumped 42 barrels from Arbuckle lime, Ordovician 3751-73 feet, TD 3791.

Trego County, Spring Creek field. Peel & Hardman's Lang 1, SE SE SE 32-12s-21w, pumped 71 barrels from Arbuckle lime, Ordovician 3902-06 feet, TD 3951.

KANSAS—NEW OIL PAY

Barton County, Barrett field. Anschutz' Fleming 1, SW SW NE 36-16s-14w,

But what is an expert? Webster says, "one who has a special skill or knowledge; a specialist." Certainly that includes the Republic personnel. Backed with the newest and finest equipment, much of which they themselves designed and manufactured, plus the experience in many years of successful exploratory work, Republic's Supervisors and Party Chiefs offer the producer the maximum in reliable analysis and interpretation.

In the field of surface shooting alone Republic crews have been successful in uncovering large areas that before were thought unworkable. In all geophysical operations it's equipment . . . skill . . . and integrity that pay off in successful surveys, so call on experts for the job—CALL ON REPUBLIC.

REPUBLIC EXPLORATION COMPANY

815 S. Boulder
TULSA, Oklahoma

407 N. Garfield
MIDLAND, Texas

...BUT NO NEED TO WEEP

Cased-off oil sands can be located, even through several strings of casing, with Radioactivity Well Logging. To eliminate "lost motion" and unnecessary expense in completion, production and maintenance, make Radioactivity Logging a standard practice.

- **Gamma Ray Curve with Collar Log and Neutron Curve will keep you from being the loser.**

Well Surveys, Inc.

TULSA, OKLAHOMA U.S.A.

LANE-WELLS COMPANY
UNITED STATES & CANADA
SEISMOGRAPH SERVICE CORP. of Delaware
MEXICO
GEOTECNICA, S. A.
BUENOS AIRES, ARGENTINA
PETRO-TECH SERVICE CO.
CARACAS, VENEZUELA

pumped 203 barrels from Lansing-KC lime, Pennsylvanian 3353-58 feet, TD 3467.

SOUTH LOUISIANA—NEW OIL FIELDS

Iberville Parish. Glassell & Glassell's A. M. Cotten et al 1-A, in 47-9s-9e, flowed 161 barrels from 8780-8816 feet, 26.3-gravity, ⅛-inch, completed 10-19-51, TD 10,239.

Plaquemines Parish. The Texas Company's State Lease 1607- 1-A, in 22s-21e, flowed 97 barrels from 8363-71 feet, 36-gravity, 5/64-inch, completed 10-3-51, TD 10,142.

SOUTH LOUISIANA—NEW DISTILLATE FIELD

Cameron Parish. Pan American Producing Company's Miami Corporation 1, in 4-15s-3w, flowed 130 barrels and 5-million from 12,362-372 feet, 46.1-gravity, 18/64-inch, completed 10-5-51, TD 12,706.

SOUTH LOUISIANA—NEW DISTILLATE PAY

Calcasieu Parish, Iowa field. Louis J. Roussel's R. Haggert et al 2, in 11-9s-13w, flowed 332 barrels and 3-million from 11,023-034 feet, 50-gravity, 12/64-inch, completed 10-2-51, TD 11,140.

MISSISSIPPI—NEW OIL FIELDS

Adams County, "Cowpen Point" field. Humble's James S. Giles 2-B, in 7n-3w, flowed 180 barrels from Wilcox sand, Eocene 5287-91 feet, 45.6-gravity, ⅛-inch, completed 10-3-51, TD 6505.

"La Grange, North" field. Humble's E. Virginia Benbrook 1, in 62-7n-2w, flowed 54 barrels from Baker sand, Eocene 6174-79 feet, 40.0-gravity, ⅛-inch, completed 10-21-51, TD 6260.

"Wayside" field. Magnolia Petroleum Company's Netterville & Kendall 1, in 12-5n-1w, flowed 160 barrels from Baker sand, Eocene 6496-99 feet, 42-gravity, 10/64-inch, completed 10-5-51, TD 7519.

Franklin County, "Freewoods" field. Lion Oil's Thomas 1, in 3-4n-1e, flowed 110 barrels from Wilcox sand, Eocene 6381-87 feet, 32-gravity, 10/64-inch, completed 10-16-51, TD 7220.

MISSISSIPPI—NEW DISTILLATE PAY

Forrest County, Pistol Ridge field. I. P. Larue & American Liberty Oil Company's Crosby Forest Products Company 1, in 17-1s-13w, ¾-mile southeast of production, flowed 103 barrels and 1.2-million from Lower Tuscaloosa sand, Upper Cretaceous 8074-85 feet, 18/64-inch, completed 10-16-51, TD 8352.

NEBRASKA—NEW OIL FIELDS

Cheyenne County, Brownson, East field. Ohio Oil Company's Runge 1, SE NE SE 17-14n-50w, pumped 125 barrels from 1st Dakota sand, Cretaceous 4767-70 feet, completed 10-22-51, TD 4990.

Kimball County, Sisson field. Gulf Oil Corporation's Sisson 1, C NW NW 18-12n-58w, pumped 721 barrels from Dakota "J" sand, Upper Cretaceous 7326-54 feet, 38-gravity, completed 10-2-51, TD 7431.

Unnamed field. Wytex Petroleum Corporation & Derby Oil Company's I. J. Dunn 1, NE NE SE 3-13n-53w, pumped 360 barrels from Muddy sand, Cretaceous 5536-42 feet, completed 10-1-51, TD 5780.

NEBRASKA—NEW GAS FIELD

Deuel County. Charles D. Edmonson & Kansas-Nebraska Natural Gas Company, Incorporated's Troelstrup Livestock Company 1, E½ NW NE 3-12n-43w, flowed 20-million from "D" sand, Cretaceous 3215-25 feet, TD 3322.

NEW MEXICO—OIL FIELD EXTENSION

Lea County, Saunders field. Atlantic Refining Company's State 1-R, in 27-14s-33e, 1½-mile north extension, flowed 534 barrels oil and 177 barrels water from Pennsylvania sand, Pennsylvanian 9932-48 feet, 43-gravity, ⅝-inch, completed 10-6-51, TD 14,147.

NEW MEXICO—GAS FIELD EXTENSION

Lea County, Bagley-Penn field. Shell Oil Company's State 1-A, in 33-11s-33e, ½-mile northwest extension, flowed 11-million from Pennsylvania sand, Pennsylvanian 9805-15 feet, 24/64-inch, completed 10-24-51, TD 11,075.

OHIO—NEW GAS FIELD

Washington County, "Belpre" field. B. H. Putnam et al's C. O. Ahort 1, Armenia Lot, Belpre Township, flowed 2-million from Oriskany sand, Devonian 4080-4116 feet, completed 10-20-51, TD 4132.

OKLAHOMA—NEW OIL FIELDS

Carter County. Stanolind Oil & Gas Company's Mills 1, SE NE SE 17-2s-3w, pumped 33 barrels from Tussy sand, Pennsylvanian 5308-15 feet, 24-gravity, TD 6340.

Lincoln County. Flynn Oil Company's Wiley 1, SE SE NE 24-13n-2e, pumped 65 barrels from Skinner sand, Pennsylvanian 4780-88 feet, TD 4788.

Are Your Oil Interests Closely Held or Family Owned?

This bank specializes in oil financing, particularly in connection with closely held or family owned oil and gas producing properties.

Oil and Natural Gas Department

Empire Trust Company
NEW YORK

Downtown Office:
120 BROADWAY
Equitable Building

Uptown Office:
7 W. 51st STREET
at Rockefeller Center

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

BE KIND TO RESERVOIRS WEEK

You can never be too understanding of an oil and gas producing formation if you expect it to remain your best friend throughout its productive life.

Each particular reservoir is born with its own unique maximum recovery characteristics, ie., its ability to relinquish maximum high-gravity yield at minimum pressure decline. Therefore, to maintain an optimum recovery program you must learn, *early in the life of the field,* how much of the oil which you have discovered is really *recoverable* oil; how many of those recoverable reservoir barrels can be actually counted today as tomorrow's *stock tank barrels;* and by what mechanical procedures you can establish an ultimately successful production program.

No standard rules exist which fit perfectly any two producing operations. Each horizon must be studied individually, *before pressure decline can alter basic productive characteristics.*

Even at that, there's nothing complicated about it. Immediately after the completion of a key well, simply ask Core Lab to take a sample of the reservoir fluid and develope a comprehensive Reservoir Fluid Analysis Report. This vital information, combined with other formation data, then becomes your own specific "maximum reservoir revenue formula" —*good for the life of the field!*

The cost? A drop in the bucket, as compared to the increase in recoverable oil.

If it's worth producing, it's worth producing RIGHT!

Ask your Core Lab man today about Reservoir Fluid Analysis!

CORE LABORATORIES, INC. ● **IN ALL ACTIVE AREAS**

Dallas, Houston, Corpus Christi, Midland, Abilene, San Antonio, Tyler, Wichita Falls, Lubbock, and Post, Texas; Oklahoma City, Oklahoma; Great Bend, Kansas; Shreveport, Lafayette and New Orleans, Louisiana; Natchez, Mississippi; Bakersfield, California; Denver, Colorado; Worland, Wyoming; El Dorado, Arkansas; Farmington, New Mexico; Calgary and Edmonton, Canada; Venezuela, S. A.

CORE LAB

PETROLEUM RESERVOIR ENGINEERING

Osage County. A. G. Oliphant's Osage 1, W½ W½ SE 4-25n-4e, pumped 60 barrels oil and 7 barrels water from Missisippi chat, Mississippian 3342-3432 feet, TD 3432.

Payne County. Lee Evans' Cobble 1, SW NE NE 14-19n-6e, pumped 40 barrels from Simpson dolomite, Ordovician 3317-38 feet, 41-gravity, TD 3342.

Unnamed field. Massad Oil Company's Roy V. Delay 1, NE NW NW 26-19n-6e, pumped 26 barrels from Burgess sand, Pennsylvanian 3340-46 feet, 41.5-gravity, TD 3501.

Pottawatomie County. An-Son Petroleum Corporation et al's Truesdell 1-A, (OWWO), NE SE NW 31-8n-5e, pumped 30 barrels oil and 15 barrels water from Hunton lime, Devonian 4025-86 feet, TD 4380.

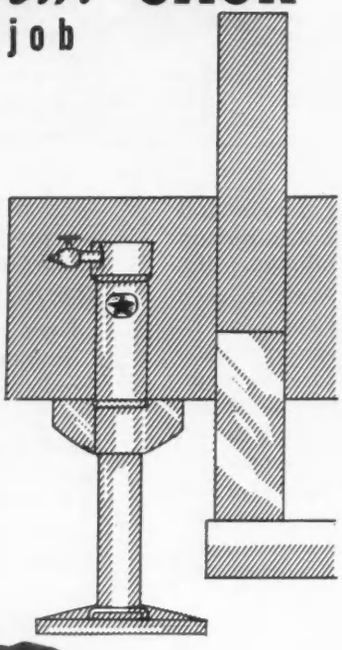
Unnamed field. Helmerich & Payne's L. A. Cope 1, NE NE SW 2-8n-3e, pumped 5 barrels oil and 50 barrels water from Simpson dolomite, Ordovician 5070-80 feet, 36-gravity, TD 5095.

Unnamed field. Sunray Oil Corporation's State of Oklahoma 1, NW SE SE 16-8n-2e, flowed 132 barrels from Bois D'Arc lime, Devonian 5210-50 feet, 24-gravity, TD 6069.

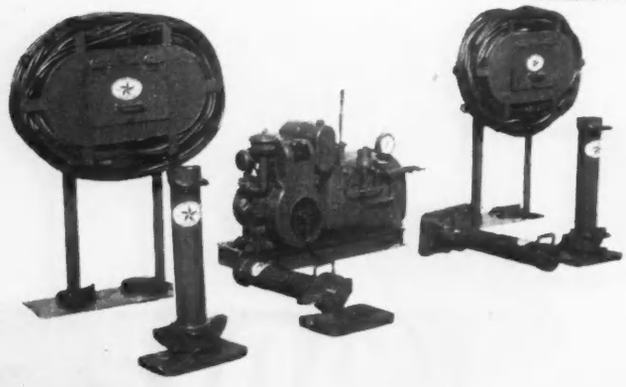
Seminole County. F. E. Miller's Fanny Wooldridge 1, SE NW SW 27-8n-5e, pumped 125 barrels from Simpson dolomite, Ordovician 4385-4440 feet, TD 4440.

Tillman County. Sunray's Cart Cassidy 1, NE NE SE 1-3s-18w, pumped 8 barrels oil and 10 barrels water from Canyon lime, Pennsylvanian 3018-28 feet, 37-gravity, TD 5542.

MOVING A RIG?
GET THE RIGHT **JACK**
for the job



For a BIG LIFT in rig moving, or anywhere in the field use a Texas Flange Co. Hydraulic Jack Unit. It is portable brawn that can do a day's work without looking back. Mount one in the back of your pick-up or buy the skid-mounted type that does a whale of a job with winch truck operation. Our four-jack unit is complete with portable motor, 10,000 p. s. i. pump, two hose reels, tool compartments, and four jack stands.



SPECIAL JACKS BUILT TO YOUR SPECIFICATIONS

TFC TEXAS FLANGE CO.
P. O. BOX 1352 • PHONE 6-6877 • ODESSA, TEXAS

OKLAHOMA—NEW OIL PAY

Noble County, Lucien field. T. N. Berry & Company's D. Kolb 1, SE NW NE 33-20n-2w, pumped 46 barrels oil and 100 barrels water from 2nd Tonkawa sand, Pennsylvanian 3145-51 feet, 38-gravity, TD 4047.

OKLAHOMA—OIL FIELD EXTENSION

Carter County, Fox-Graham field. Magnolia's Susan Lahman 5 (OWDD), NW SW NW 23-2s-3w, 2½-mile southeast extension, flowed 360 barrels from Lower Springer sand, Pennsylvanian 4475-80 feet, 39.8-gravity, ¼-inch, TD 5033.

OKLAHOMA—NEW DISTILLATE FIELD

Beckham County. United Carbon Company's Clark Unit 1, C NE NW 32-12n-21w, flowed 33 barrels and 0.4-million from Hoxbar conglomerate, Pennsylvanian 12,720-14,600 feet, 58-gravity, 22/64-inch, TD 14,661.

OKLAHOMA—NEW GAS FIELD

Noble County. T. N. Berry's Nelson 1, NE NW NE 30-20n-1w, flowed 7.3-million from Perry sand, Mississippian 3438-40 feet, TD 4395.

TEXAS DISTRICT 1—NEW OIL FIELD

Frio County. Forney & Winn's Marburger 1, Rusk T. County Survey, pumped 51 barrels from Navarro sand, Upper Cretaceous 3496-3536 feet, 46-gravity, completed 10-8-51, TD 3536.

TEXAS DISTRICT 2—NEW OIL FIELD

Live Oak County. Harry Hotchkins' W. Liska 1-A, John Hefferman Survey, pumped 8 barrels from Hockley sand, Eocene 975-81 feet, 20.2-gravity, completed 10-11-51, TD 982.

TEXAS DISTRICT 2—NEW GAS FIELD

DeWitt County. Sunray's Gus F. Baacke 1, Enoch Jones Survey, flowed 4.4-million from Slick sand, Eocene 7577-86 feet, open, completed 10-1-51, TD 7850.

TEXAS DISTRICT 2—GAS FIELD EXTENSIONS

Goliad County, Cabeza Creek, South field. The Texas Company's Mrs. Elizabeth Reed 1, Manuel Carriona Survey, ½-mile south extension, flowed 1.5-million from 8268-72 feet, open, completed 9-14-51, TD 8514.

Terrell Point field. J. D. Wrather, Junior's Johnson & Walker 1, Cuadrilla Irrigation Company Survey, ½-mile northwest extension, flowed 7.7-million from 3996-4000 feet, and 7.7-million from 4255-60 feet, open, completed 7-8-51, TD 5077.

TEXAS DISTRICT 3—NEW OIL PAYS

Colorado County, Frelsburg field. Sinclair's H. R. Cullen 1, Casper Simon Survey, flowed 366 barrels from Cullen sand, Eocene 9672-80 feet, 43.2-gravity, 10/64-inch, completed 9-29-51, TD 10,425.

Fayette County, Blue Ridge field. John Mitchell et al's Evans Bailey 1, ETRR Survey, flowed 205 barrels from Vicksburg sand, Oligocene 7841-46 feet, 28-gravity, 9/64-inch, completed 10-26-51, TD 7908.

Jefferson County, Clam Lake field. Shell's McFaddin Trust 24, Mrs. Sarah A. Pace Survey, flowed 173 barrels from 4752-60

TOP PERFORMANCE AT ROCK BOTTOM COST

WITH THE GUIBERSON

TYPE "B" TUBING SPIDER

Stock sizes 1" to 3"; spiders are available on special order for 2" x 1" and 2½" x 1¼" parallel strings.

The Guiberson Type "B" tubing spider is a fast-handling, light-weight tool that can be handled by one man if necessary — and the cost of the "B" is light-weight, too. No other spider in its class offers greater economy, either initially or in the long run.

Despite its exceptionally light weight, the Type "B" spider will hold the longest string, and release instantly without sticking when you pick up. All slips fit the same bowl, and the "B" will not distort or damage tubing. Self-equalizing slips with hard, sharp teeth, give full, large-area contact, assuring positive grip, better load distribution and perfect release.

For positive performance, maximum protection, amazing handling ease and surprisingly low cost, you can count on the sure-grip "B" Tubing Spider.

SAFE THAN SORRY — GUIBERSON — BETTER BE

REG. U.S. PAT. OFF.

SOLD BY LEADING OIL FIELD SUPPLY STORES EVERYWHERE

Established 1919

THE GUIBERSON CORPORATION

Dallas, Texas U. S. A.

feet, 28-gravity, 9/64-inch, completed 10-22-51, TD 6620.

Orange County, Orange field. W. V. Bowles' F. T. Peveto 1 (OWWO), William Dyson Survey, flowed 181 barrels from Miocene sand, Miocene 3274-3300 feet, 22.3-gravity, 10/64-inch, completed 10-10-51, TD 5605.

TEXAS DISTRICT 3—NEW GAS FIELDS

Brazoria County. G. S. Hammon & Wheless Oil Company's W. E. Tieman 1, Lot 22, BBB&C Survey, flowed 6.4-million from 11,184-190 feet, open, completed 10-12-51, TD 11,338.

Madison County. J. M. West's E. M. Rhodes 1, Z. Robinson Survey, flowed 25-million from 8522-25 feet, open, completed 10-18-51, TD 8525.

Tyler County. C. N. Housh & Humble's Read et al 1, BBB&C Survey, flowed 13.5-million from Wilcox sand, Eocene 9804-14 feet, completed 9-25-51, TD 9904.

Wharton County. R. E. Hibbert's Brandes 1 (OWWO), Thomas Slaughter Survey, flowed 5.7-million from 7595-7600 feet, open, TD 8517.

TEXAS DISTRICT 4—NEW OIL FIELD

Duval County. Humble's V. Kohler A-69, N. B. Gussett Survey, flowed 77 barrels from Yegua sand, Eocene 3700-11 feet, 37.0-gravity, 9/64-inch, completed 10-10-51, TD 4505.

TEXAS DISTRICT 4—NEW OIL PAYS

Duval County, Labbe field. Lewis Kelsey & W. H. Martin's Labbe Brothers 1, Section 221, J. Poitevent Survey, pumped 51 barrels from 2792-95 feet, 23.1-gravity, completed 10-12-51, TD 2850.

Kenedy County, Sarita field. Humble's John G. Kenedy Junior 28-B, El Paistle Grant, flowed 107 barrels from 6423-31 feet, 41-gravity, ⅛-inch, completed 10-1-51, TD 9500.

Starr County, El Javali field. The Chicago Corporation's Bessie H. Cocke 2-B, El Javali Grant, pumped 19 barrels from 2315-23 feet, 31.8-gravity, completed 10-12-51, TD 2388.

TEXAS DISTRICT 4—NEW DISTILLATE PAY

Starr County, Sun, North field. Sun Oil Company's Blas Requenez et al 2, La Sal Colorado Grant, flowed 45 barrels and 1.5-million from 5074-88 feet, 3/16-inch, completed 9-30-51, TD 7765.

TEXAS DISTRICT 4—GAS FIELD EXTENSION

Nueces County, Nueces Bay, West field. Phillips Petroleum Company's Master 3, State Tract 745, ⅝-mile northwest extension, flowed 1.8-million from Oakville sand, Miocene 1644-50 feet, open, completed 9-26-51, TD 6600.

TEXAS DISTRICT 5—NEW GAS FIELD

Leon County. Humble's Lester Foran et al 1, John Harrington & Thomas Ross Survey, flowed 10-million from Woodbine sand, Upper Cretaceous 5738-60 feet, open, completed 10-8-51, TD 10,610.

TEXAS DISTRICT 6—NEW OIL PAY

Harrison County, Woodlawn field. R. W. Fair's Medine 1, J. Bowman Survey, flowed 69 barrels from Pettit lime, Lower Cretaceous 6513-80 feet, 46-gravity, ¼-inch, completed 10-19-51, TD 6628.

TEXAS DISTRICT 6—NEW DISTILLATE PAY

Panola County, Carthage field. O. B. Siler et al's Fonville Heirs 1, Abraham Bocker Survey, flowed 27 barrels and 37-million from Pettit lime, Lower Cretaceous 6192-6204 feet, open, completed 10-1-51, TD 6297.

TEXAS DISTRICT 7-C—NEW OIL FIELDS

Irion County. Moore Exploration Company's W. M. Noelke Estate 1, Section 1150, TCRP Survey, flowed 177 barrels from Ellenburger lime, Ordovician 7819-38 feet, 44-gravity, 5/16-inch, completed 10-4-51, TD 7838.

Unnamed field. G. W. Strake's Mrs. Lillian Seeligson Winterbotham 1-B, Section 30, Block 21, H&TC Survey, flowed 32 barrels from Wolfcamp lime, Permian 6588-6606 feet, 40.5-gravity, 22/64-inch, completed 10-11-51, TD 8015.

Reagan County. Sohio Petroleum Company's Leonard Proctor 1, Section 32, Block 36, T-5-S, T&P Survey, flowed 645 barrels from Lower Spraberry sand, Permian 7565-96 feet, 40-gravity, 25/64-inch, completed 10-29-51, TD 7656.

Runnels County. Miami Operating Company, Incorporated's Joe Ashton 1, S. F. Austin & S. M. Williams Survey, flowed 115 barrels from Gardner sand, Penn-

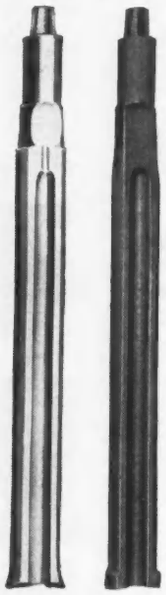
In the American Tradition

PRESERVE YOUR FREEDOM!

It is not enough to select the best person for each political office, work for his nomination, and vote for, and elect him to office on election day.

We must keep ourselves fully informed on current issues and their effect on us *and* our countrymen . . . and persistently acquaint our representative with our view on these matters. He wants to know what we think, and will reflect our views in his actions.

We can't depend on others to do this for us, if we are to preserve freedom for ourselves and our children. It is no "let George do it" task; nor a job for clubs, associations, and other groups alone. It is an important obligation that you and I, each as a responsible citizen, must accept individually. Write, call, or personally visit your political servants. It is your privilege, duty, and opportunity.



Get Maximum "Footage-per-Dressing" with SPANG Heat-Treated DRILLING BITS

The HIGHER STANDARD

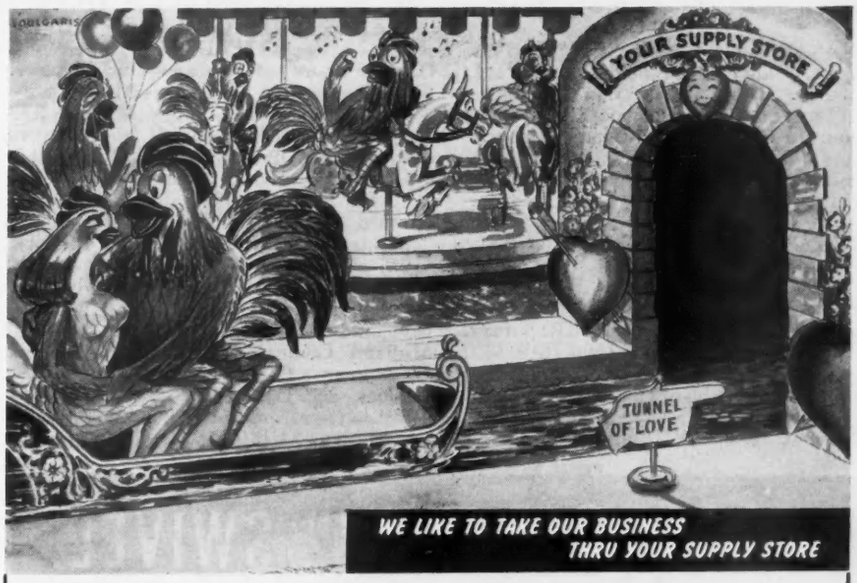
SPANG CABLE TOOLS made by SPANG & CO. BUTLER, PA.

for

OIL WELLS • GAS WELLS • ARTESIAN WELLS
SHOT BLAST HOLES • PROSPECT DRILLING

SPECIFY SPANG—FOR SALE BY DEALERS EVERYWHERE

"Chesty" has the Right Idea



Reproduced at the right is an ad of The Larkin Packer Company, — featuring "Chesty", a smart old rooster. This is but one of many ads by this Company emphasizing the importance of the Supply Company in serving the Oil Industry.

CHESTY KNOWS that business, however good it might be, is always much better if it is attended to in the appropriate setting. He just naturally seeks out the place where he knows that his affairs can be conducted in an atmosphere of pleasant understanding and mutual confidence—to the maximum benefit of all concerned.

THERE ARE SOME who like to try all the rides in the park but Chesty and Bresstine know better.

WE'VE BEEN DOING IT so long we just don't even think about taking our business any place but ". . . . THROUGH YOUR SUPPLY STORE".

LARKIN
...Through Your Supply Store

WILSON SUPPLY COMPANY has Served The Drilling and Producing Industries AND The Manufacturer for More Than 30 Years

More and more leading manufacturers such as Larkin Packer Company, recognize the importance of doing business exclusively through the established recognized Supply Companies.

The Wilson Supply Company through its 16 stores and 4 Sales Offices, has been serving the Drilling and Producing Industries throughout the Gulf Coast for more than 30 years, with a complete line of Oil and Gas Well supplies.

These stores are stocked with products from the leading manufacturer's, and staffed by experienced supply men. Service to the Field, day or night, of supplies you can depend upon—has been the foundation of Wilson Supply Company's growth over the years.

WILSON SUPPLY COMPANY

BRANCH STORES

TEXAS—Alice, Corpus Christi, Victoria, Bay City, Columbus, Barbers Hill, Liberty, Beaumont, Kilgore, Monahans. LOUISIANA—Lake Charles, New Iberia, Houma, Harvey, Shreveport.

1412 Maury St.
HOUSTON
TEXAS

Sales Offices:
TULSA
DALLAS
NEW ORLEANS
SHREVEPORT

sylvanian 3790-4218 feet, 41.5-gravity, 5/16-inch, completed 9-16-51, TD 4218.

TEXAS DISTRICT 7-C—NEW OIL PAY

Reagan County, Sugg field. Atlantic's J. D. Sugg Estate 1-B, Section 135, Block 2, T&P Survey, 1 mile south of production, flowed 405 barrels from Spraberry sand, Permian 5495-5549 feet, 43.7-gravity, ½-inch, completed 10-2-51, TD 5549.

TEXAS DISTRICT 7-C—NEW GAS FIELDS

McCulloch County. Prince Brothers & Gehle Drilling Company's W. C. Johnson 1, Block 15, Indianola RR Survey, flowed 1.5-million from 1590-1618 feet, completed 9-5-51, TD 2125.

Sutton County. Shell's W. A. Miers 3 (OWWO), Section 53, Block 14, TW-NG Survey, flowed 13-million from Des Moines sand, Pennsylvanian 4149-4284 feet, open, completed 10-3-51, TD 5009.

TEXAS DISTRICT 8—NEW OIL FIELDS

Dawson County. Greenbrier Oil Company & Mendota Oil Company's M. C. Lindsey 1, Section 132, Block M, EL&RR Survey, flowed 403 barrels from Strawn Reef lime, Pennsylvanian 10,957-967 feet, 45.2-gravity, ¼-inch, completed 10-13-51, TD 10,972.

Howard County. Lloyd H. Smith, Incorporated's John Boyd 1, Section 4, Block 25, H&TC Survey, flowed 215 barrels from Strawn Reef lime, Pennsylvanian 7650-70 feet, 43.9-gravity, 12/64-inch, completed 10-18-51, TD 7723.

Midland County. Blackwood & Nichols Company's E. Hofferkamp 1, Section 19, Block 38, T-1-S, T&P Survey, flowed 201 barrels from Lower Bend lime, Pennsylvanian 11,140-316 feet, 46-gravity, 3/16-inch, completed 10-23-51, TD 11,316.

Unnamed field. The Texas Company's Fletcher Curry 1, Section 29, Block 40, T-2-S, T&P Survey, pumped 32 barrels from Spraberry sand, Permian 7880-8805 feet, 34.6-gravity, completed 9-29-51, TD 8805.

Mitchell County. Richardson & Bass' J. F. McCabe 1, Section 5, Block 12, H&TC Survey, flowed 78 barrels from Lower Cisco sand, Pennsylvanian 6045-60 feet, 42.7-gravity, ⅜-inch, completed 10-21-51, TD 7330.

Pecos County, "Brown & Thorp" field. Brown & Thorp Drilling Company's G. W. White-Gulf 1, Section 49, Block 11, H&GN Survey, flowed 194 barrels from Clearfork lime, Permian 3040-50 feet, 38.6-gravity, completed 10-24-51, TD 3051.

TEXAS DISTRICT 8—OIL FIELD EXTENSIONS

Glasscock County, Driver field. Placid Oil Company's William Howard 1, Section 30, Block 35, T-5-S, T&P Survey, 3-mile southeast extension, flowed 127 barrels from Spraberry sand, Permian 6490-6595 feet, 37.5 gravity, ⅜-inch, completed 10-31-51, TD 6595.

Midland County, Driver field. Ashland Oil & Refining Company's Davenport 2-46, Section 46, Block 37, T&P Survey, 1¼-mile extension, flowed 308 barrels from Spraberry sand, Permian 6976-88 feet, 36.7-gravity, 22/64-inch, completed 10-9-51, TD 6988.

Midland County, Midkiff field. Republic Natural Gas Company's J. R. Bryant Estate 1, Section 37, Block 38, T-4-S, T&P Survey, 1-mile extension, flowed 497 barrels from Spraberry sand, Permian 7182-7229 feet, 34.5-gravity, 1-inch, completed 10-8-51, TD 7229.

Parks-Penn field. American Viking Corporation's C. E. McCaughey 1, Section 44, Block 40, T-2-S, H. G. Purcell Survey, 1-mile north extension, flowed 263 barrels from Strawn sand, Pennsylvanian 10,521-541 feet, 45-gravity, ¼-inch, completed 10-24-51, TD 10,603.

Sweetie Peck field. Sinclair's June Tippett 2, Section 12, Block 41, T-4-S, T&P Survey, 3-mile northeast extension, flowed 262 barrels from Pennsylvania sand, Pennsylvanian 10,755-790 feet, 52.8-gravity, completed 10-3-51, TD 13,232.

Pecos County, "Brown & Thorp" field. Brown & Thorp's Sunray-White & Baker 1, Section 49, Block 11, H&GN Survey, ½-mile southeast extension, flowed 146 barrels from Clearfork lime, Permian 3012-3113 feet, 38.5-gravity, completed 10-8-51, TD 3113.

TEXAS DISTRICT 10—GAS FIELD EXTENSION

Carson County, Panhandle field. The Texas Company's Knorpp 1, Section 135, Block 7, I&GN Survey, southwest extension, flowed 1-million from 2902-3000 feet, completed 10-1-51, TD 3000.

WYOMING—NEW OIL PAY

Converse County, Cole Creek, South field. Ralph Lowe's Ethel Wilson 1, SW NE NW 19-34n-76w, 1 mile west of production, pumped 140 barrels from Muddy sand, Cretaceous 9013-36 feet, 34-gravity, completed 10-20-51, TD 9236.

WYOMING—NEW GAS FIELD

Sublette County. Northern Ordnance Oil Company's Mickelson 1, NW NW SW 4-29n-113w, flowed 0.1-million from Wasatch sand, Eocene 2214-2818 feet, open, completed 10-27-51, TD 2532.

KING "50-XV" SWIVEL

FINEST IN THE FIELD

A swivel for drilling medium depth oil wells, deeper water wells, workover rigs, slim hole drilling and "drilling in" oil wells by the reverse circulation method.

Check these features of the 50-XV King Type Swivel:

OVERSIZED WATER COURSES assure larger fluid volume.

MOLDED RUBBER PACKINGS eliminate stuffing boxes.

HARDENED WEAR BUSHINGS eliminate wash pipes.

THE PACKING AND WEAR-BUSHINGS can be renewed within a very few minutes without removing any other part from the swivel.

ANGULAR CONTACT BALL BEARINGS provide ample thrust capacity and insure radial stability.

ALLOY STEEL CONSTRUCTION assures safety with minimum weight.

CLOSED HOUSING PROTECTS BEARINGS.

Export: R. S. Stokvis & Sons Inc.
17 Battery Place
New York, N. Y.

See your latest Composite Catalog for information on other King products.

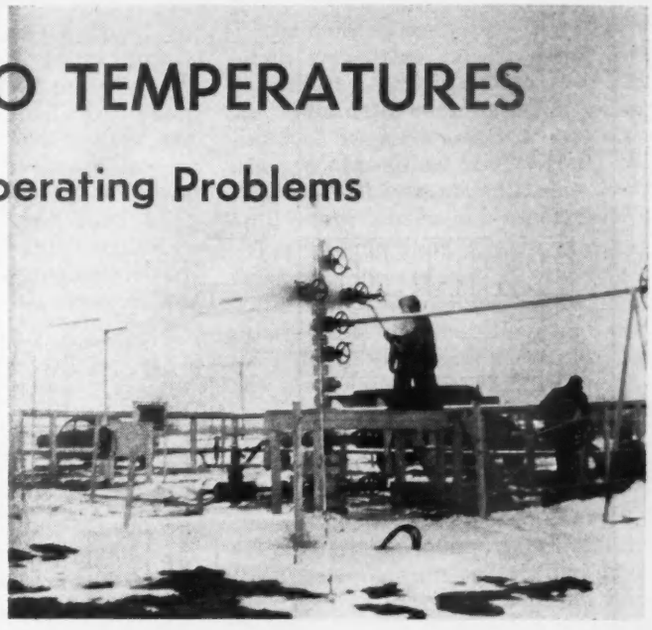
KING OIL TOOLS

210 TERMINAL ST. HOUSTON 20, TEXAS OSage 3-3421

CANADA'S SUBZERO TEMPERATURES

Create Complex Operating Problems

AMERICAN OPERATORS who have moved into the Canadian oil producing areas are encountering complex problems created by subzero temperatures which exist approximately 60 percent of the time. This discussion deals with some of these problems and offers at least a partial solution to many.



Frozen wellhead connections often require steaming before production can be delivered to storage.

By D. J. ELLIOTT, Chief Engineer, Bettis Corporation

DRILLING rigs must operate in Canadian fields when daily temperatures are 20 below zero, or lower, for at least six months out of each year. In addition, sudden weather changes often drop the temperature below freezing for short periods throughout the year. Because of these weather conditions, the drilling rig operator must anticipate and prepare for subzero weather at least sixty percent of the time.

The extremely severe cold presents problems which the average drilling contractor cannot comprehend. For instance, a northern Alberta wildcat operating in 60 below zero temperature had the kelly joint freeze solid in the rathole while a trip was being made. This operator solved the problem by buying another kelly joint and digging another rathole.

The above is not an isolated instance. It is a common occurrence for mud pits to freeze over; for mud pumps being rendered inoperative by suction lines freezing solid; standpipes freezing solid while trips are made; and ratholes and mouseholes freezing solid when they are not used for short periods. A major hazard is caused by the icing-over and freezing of blowout preventers and cellar control valves, rendering them completely useless until they have been thawed. Frozen mud on tool joint threads is a common cause of twist offs, which occur because the joints could not be properly made up when the pipe was run into the hole. Freezing of water lines about the rig is a constant and sometimes serious problem.

Another factor which the rig operator must consider is that of heat for the drilling crews. Derricks are enclosed from the ground to the first girt, but these enclosures serve mainly to ward off the bitter winds. Some provision must be made to raise the temperatures inside the enclosures high enough to permit the crews to work with something approaching comfort. Unless natural gas is available for heaters, this matter of furnishing heat for the crews is a major factor. When open fires are used a major hazard is created.

Production Difficulties

Difficulties in producing oil from Canadian wells are almost as numerous and complex as those encountered in drilling operations. However, the element of danger and loss is not as great.

Principal problems are the freezing of flow lines and lead lines from the wells to the tank batteries; an incredibly fast formation of paraffin as the oil flows from the comparatively warm well into the cold surface lines; and freezing of gas in meter runs. Extreme difficulty is also encountered in moving the half-frozen, sludge-like crude through transmission lines and pumps.

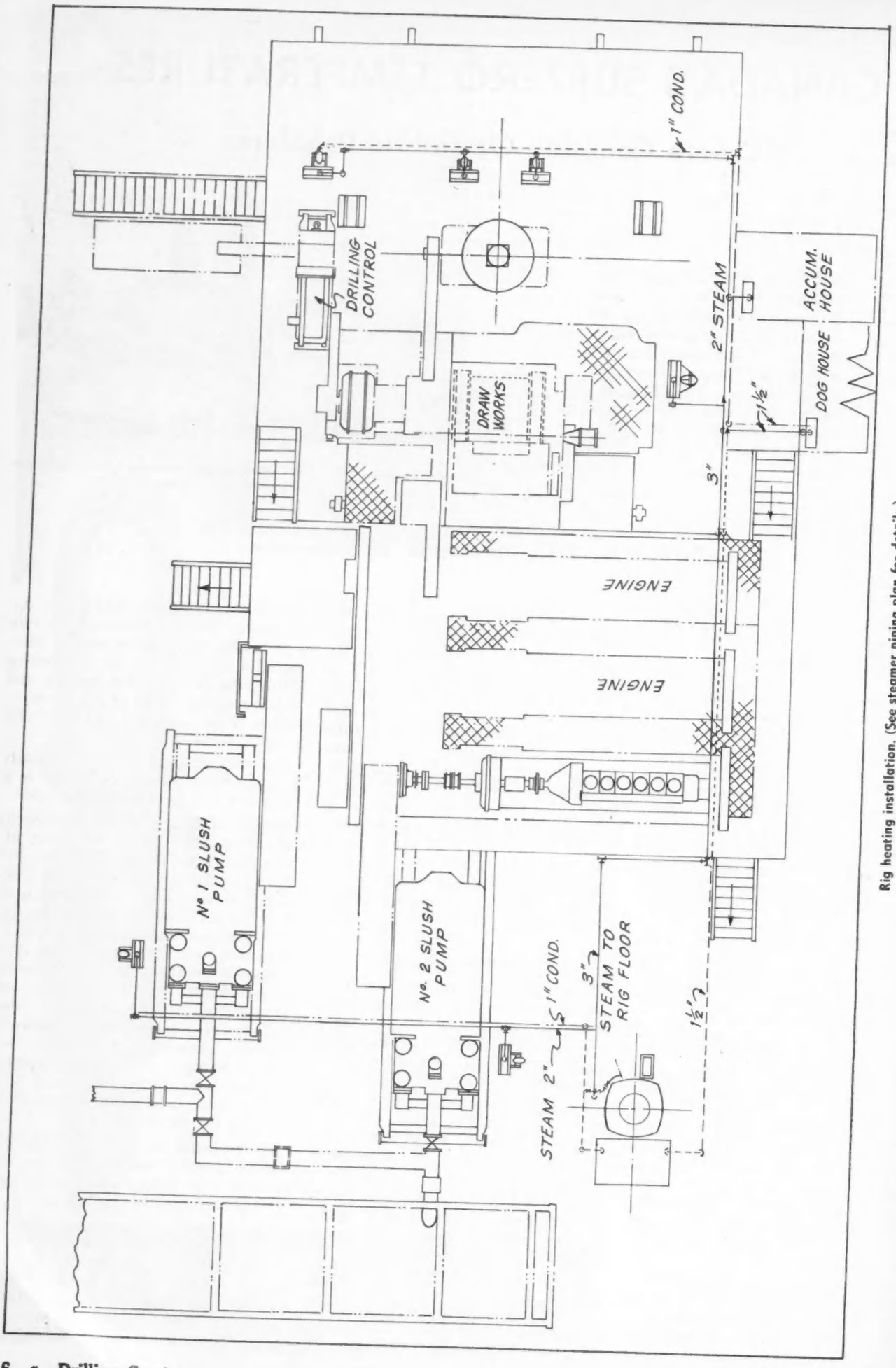
These difficulties, while they are not peculiar to Canadian fields alone, are nevertheless intensified by the subzero weather. In addition, operators in the Canadian fields are subject to the more-or-less normal ills—paraffin deposition inside the tubing string; the necessity for heating and treating certain types of crude, etc.—which beset operators in other and warmer areas.

In the Canadian oil fields, a ready and generous supply of steam is a most effective weapon against cold.

Steam drilling rigs are a rarity in Canadian fields, their use being almost prohibited by weather, fuel and water conditions. This being the case, it is obvious that if an operator is to have the use of steam around the rig, he must have an independent source. Assuming that a boiler of some type is on the location, it is a relatively simple matter to prevent lines and fittings from freezing, or to thaw them out after they have frozen. On valves, blowout preventers, tool joints and small fittings, the most effective method is to spray them with live steam at frequent enough intervals to prevent the formation of ice.

If the boiler has sufficient capacity, steam heaters can be used on the drilling rig floor, thus solving the problem of heat for the crews.

In production operations, steam is used to heat flow lines to prevent freezing and to prevent and remove paraffin deposition. It is also used to prevent gas from freezing in meter runs and lines, and to steam annular spaces and tubing strings to remove



Rig heating installation. (See steamer piping plan for details.)

paraffin. The same steam is used for heating and treating, and for other various applications in which heat is required. Transmission companies often place a boiler in each pump house to heat and facilitate pumping of heavy crudes.

Portable Steam Generators

The Province of Alberta (and probably most other provinces) holds that coil type, flash steam generators with no storage capacity for steam are not classed as pressure vessels and consequently are not subject to many of the regulations set up by the Boiler Act. This applies, particularly, to those provisions concerning certified operators: No specialized personnel is required to be in constant attendance with this type of steam generator.

These compact steam generators, operating up to 600 pounds per square inch, when mounted on a truck or trailer, are completely portable and may be easily moved from one location to another. Being of the flash steam type, they are ready for instant use, without requiring a "firing-up" period during which no steam is available. Because of their construction, possibility of explosion is non-existent.

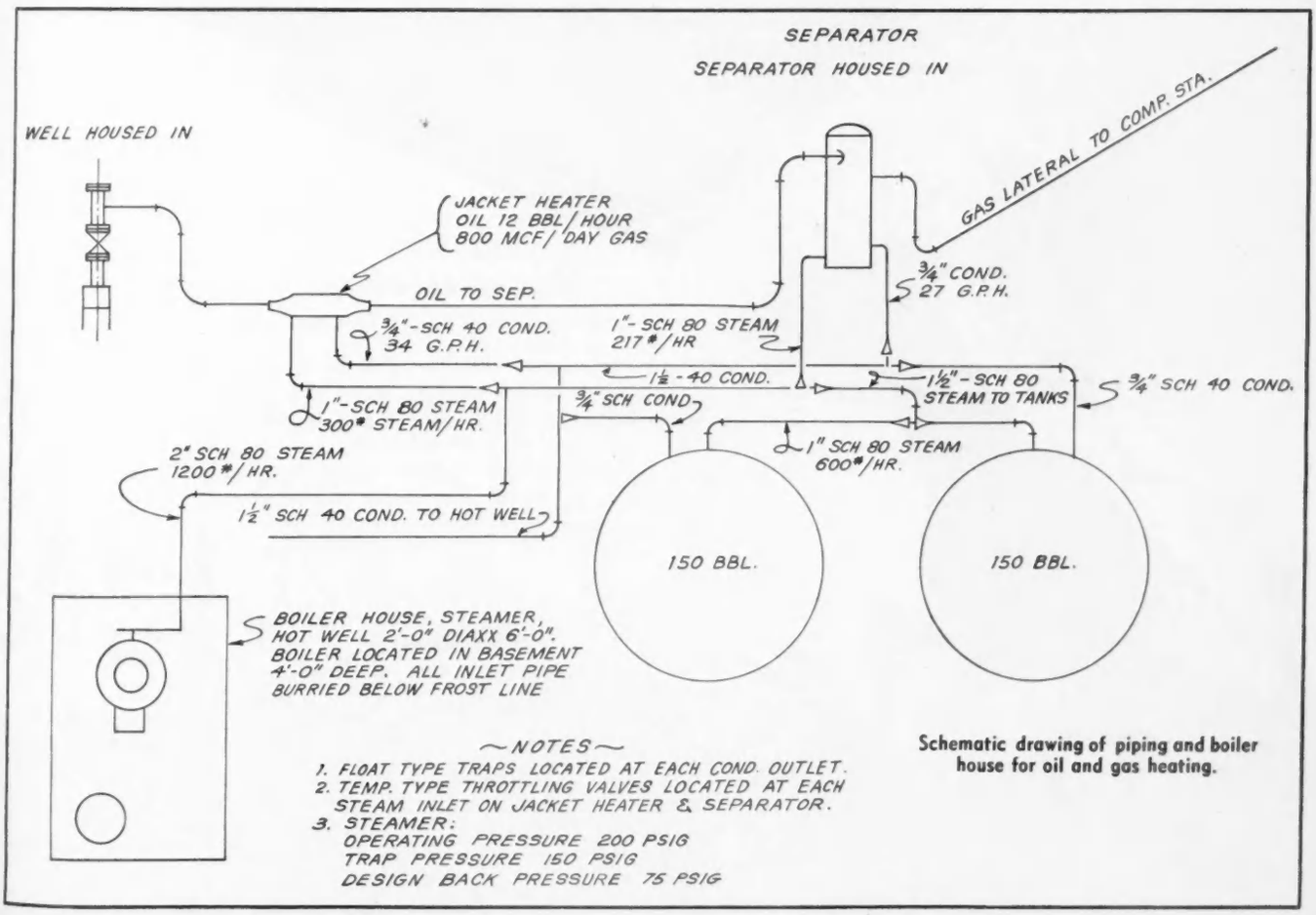
These light weight "steamers" can be mounted on a truck or trailer, or set inside a small housing and used as a permanent, stationary power plant. They require no foundation other than the skids on which they are mounted. The only requisite for efficient operation is an adequate supply of clean water and fuel, with provisions for keeping the water above freezing. Automatic controls eliminate the necessity of the steamer being attended constantly.

For use around the drilling rig, a steam generator of this type is usually fired continously during extremely cold weather, permitting the heat from the condensate return line to be utilized in warming the boiler feed water. In warmer weather, since a unit of this type will generate full steam pressure and volume within about three minutes, it is customary to fire the unit only when steam is actually required. Ordinarily, 300 pounds of steam pressure is sufficient for drilling rig service. However, higher pressures are sometimes required when long lines (such as the standpipe, kelly joint or a single of pipe in the rathole) must be steamed out. For this reason, a steamer with a maximum working pressure of 600 pounds per square inch is recommended.

The more modern types of coil type steam generators can be fired with natural gas, kerosine, butane or fuel oils. Automatic controls inject water, and fuel proportionately to the unit, and should either source fail, the steamers will automatically shut down until corrections have been made.

For use in producing operations, the portability of the steamers is a feature that cannot be overlooked. Considering that long flow and lead lines might freeze or paraffin-up at any point, and that truck or trailer-mounted steam generators can be moved easily and quickly along the line, it would seem that the portable units offer many advantages over conventional, stationary boilers. If necessary in steaming out lines, the coil-type generators can be fired while the truck is moving along the line, thus permitting application of steam along any required length of line.

For stationary service, the steam generators may be placed in practically any type of housing. Many Canadian operators use the streamers for stationary service around tank batteries, separators and heaters, where steam can be utilized for thawing lines and freezers and also used to aid the heater whenever its British thermal unit output is exceeded.



Schematic drawing of piping and boiler house for oil and gas heating.

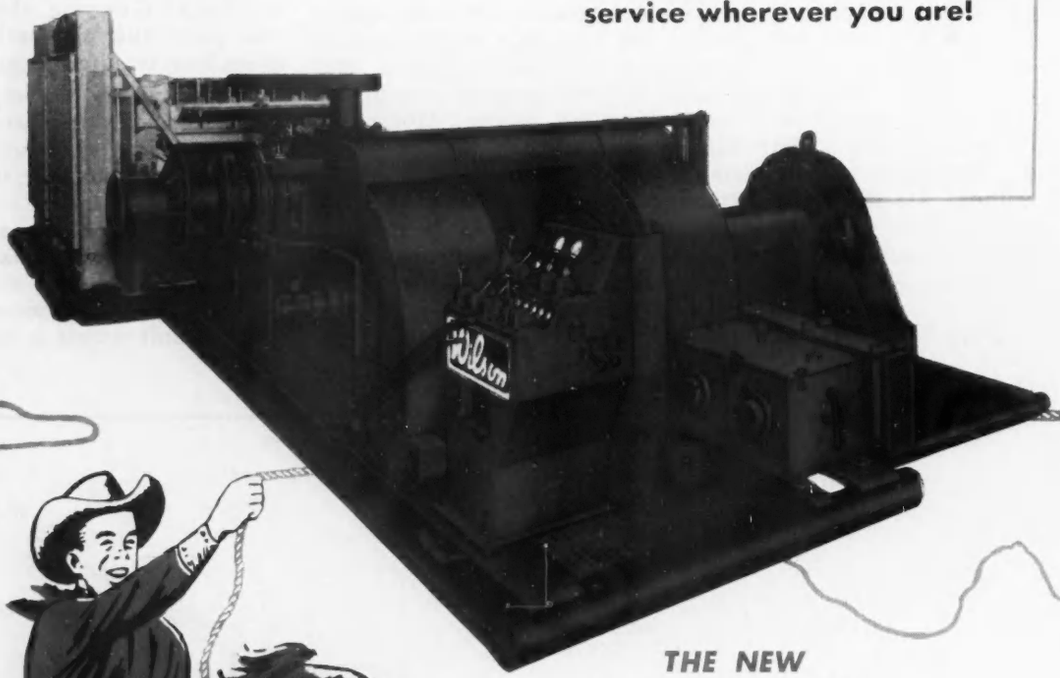
WAY DOWN SOUTH...

another in the world-wide chain of

Wilson

service & parts dealer. .

Complete Nationwide Service involving Factory trained service representatives, parts depots, sales representatives and air service is another important advantage you have when you buy a Wilson Rig. Wilson is at your service wherever you are!



THE NEW
WILSON ATLAS RIG
FOR 10,000-FOOT DRILLING

A long time favorite years ago, this old friend of the drilling contractor returns with all the latest Wilson Features. The Atlas has a 40" x 24" drum with 46" x 10" Brake Rings and still is within road width. It is completely Air Controlled from the Famous Wilson Console Control Panel, and has Air-Tube Disc Clutches on all drives throughout. Call a Wilson representative. Let him tell you about the Atlas.

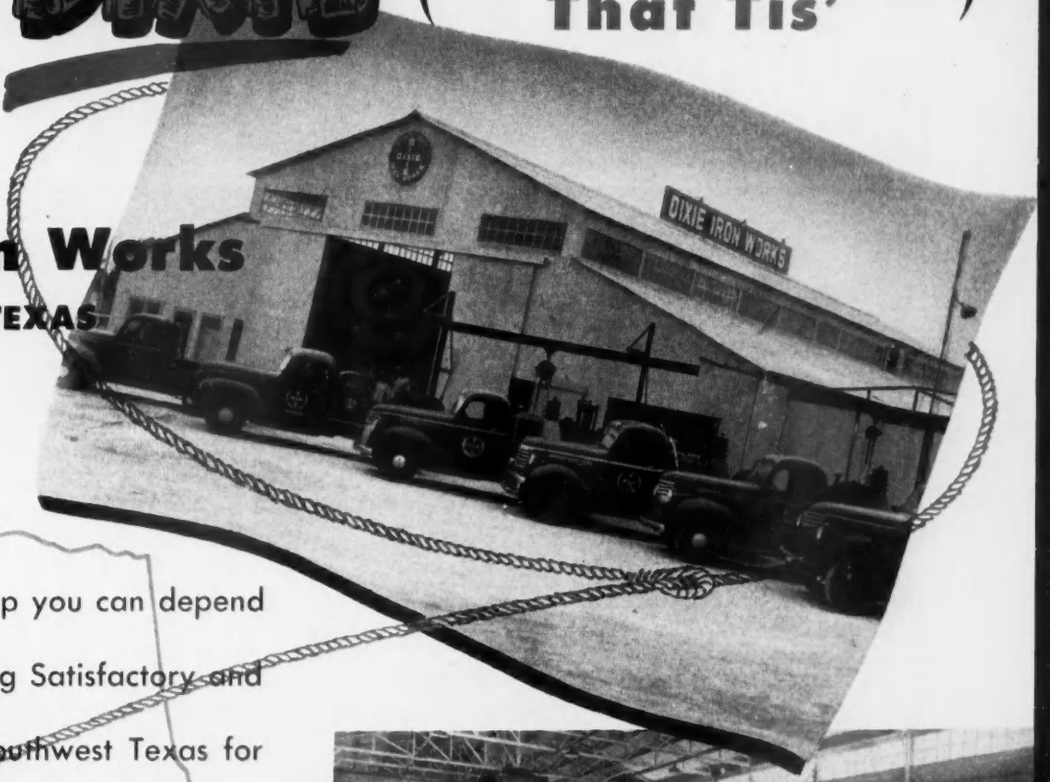
Wilson MANUFACTURING CO., Inc.

WICHITA FALLS, TEXAS

...WITH DIXIE (IRON WORKS That Tis')

...er. . Dixie Iron Works

ALICE, TEXAS



Dixie is a Service shop you can depend on. They have been giving Satisfactory and Dependable service in Southwest Texas for over 15 years. Their men are all factory trained to make sure you receive only the finest workmanship on your equipment. A Dixie Service man is available to go anywhere, any time to service or recondition any and all types of Oil Field Equipment.

A view of the Dixie Main Shop showing the transmission and drawworks of a large Drilling Rig.

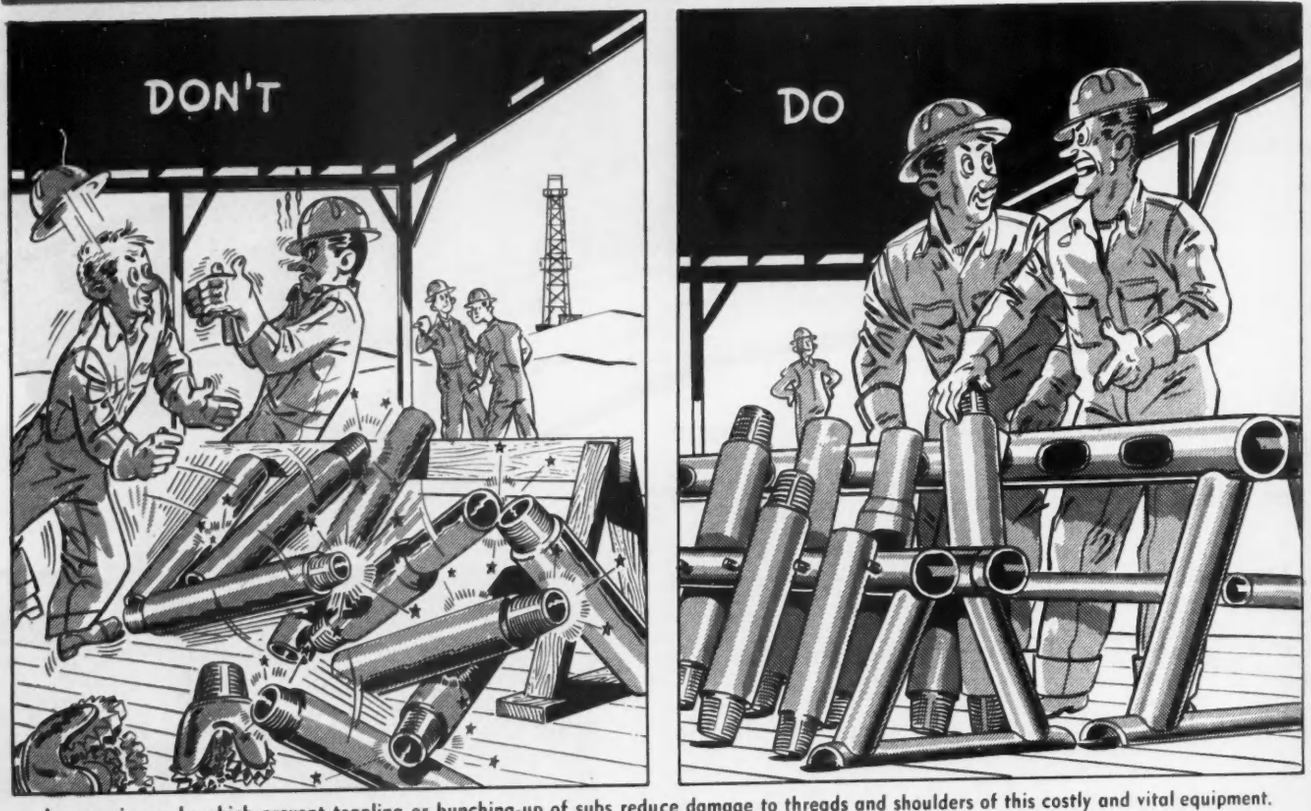
CALL DIXIE FOR WILSON SERVICE

DIXIE IRON WORKS • Ph. 1466-67; 1159-W; 1065-R • ALICE, TEXAS

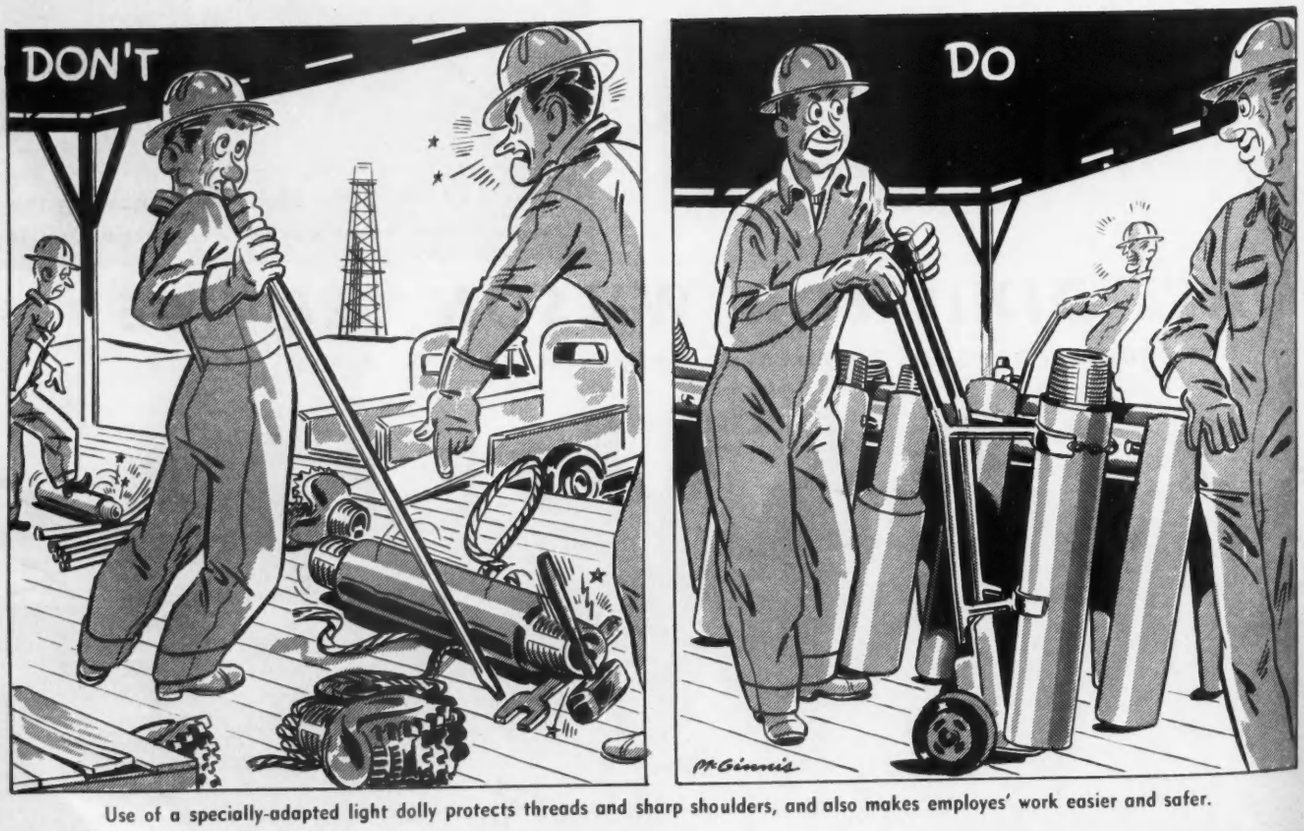
A Group picture of Dixie Iron Works Sales and Shop Personnel.

World Oil Graphics

SUB CARE



Inexpensive racks which prevent toppling or bunching-up of subs reduce damage to threads and shoulders of this costly and vital equipment.



Use of a specially-adapted light dolly protects threads and sharp shoulders, and also makes employes' work easier and safer.

Contractor's Cost Clinic—No. 6

Automatic Recorder Improves Drilling Efficiency

By W. B. COLVIN

WORLD OIL Staff

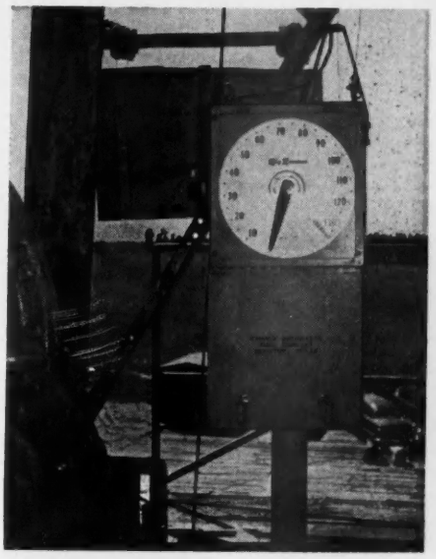


FIGURE 1. Automatic recorder is stationed in a position allowing an unobstructed view for the driller.

THE efficiency of drilling programs can be greatly enhanced by the use of a drilling recorder (Figure 1) capable of graphically presenting each individual rig operation. J. B. Buchanan, West Texas manager for the Al Buchanan Drilling Company, reports that utilization of the device provides a running record which may be transposed into a simplified accounting system. By the presence of this continuous record, Buchanan has found an easy solution to the proper training of rig personnel, particularily drillers.

Accurate Pipe Tally: An inherent problem to the drilling contractor is maintenance of an accurate pipe tally. It is not extraordinary for an error to exist in the drill pipe tally and, upon such an occurrence, much difficulty is encountered in the process of checking-out bottom hole measurements, conducting fishing jobs and related practices. Buchanan has found that the super-sensitive characteristic of the automatic time recorder permits the accurate counting of pipe stands by mere inspection of the recorder chart. With this method there is never any question concerning the accuracy of the drill pipe tally, an advantage of basic importance to the entire drilling procedure.

Aside from assuring an accurate record of the number of stands in a string, the automatic recorder indicates footage down on the kelly prior to making a trip.

Equipment Service Records: The design of the recording chart (see table) allows sufficient space to add operational data from hour to hour. If the rig is shut down for specific equipment repair, explanation of the down-time can be reported accordingly. By the transfer of these data to a permanent form, the contractor is in a position to evaluate accurately the service characteristics on each individual piece of equipment. The adoption of this procedure simplifies the bookkeeping responsibility of the driller, derrickman and remaining members of the crew.

AUTOMATIC DRILLING time recorders are not new tools in the industry. However, day to day operation of the equipment has opened many different fields of versatile application. Described herein are several operations which can be completed with an automatic logging device. Aside from indicating a precision drilling record, information collected with the device permits the establishment of a simplified accounting system, the accurate maintenance of a pipe tally, compilation of equipment service records, and increased safety in rig operation.

Buchanan has made it a practice to expand the above procedure by including the expense of parts and labor required for equipment repair. In this manner, an accurate, continuous record of equipment service is always available.

The exacting compilation of these data is invaluable for consideration in the future purchase of drilling equipment. Established to afford complete coverage of equipment down-time, the program will also reveal the practices of negligent rig operation. The tour-to-tour record will indicate, by a continuous series of breakdowns, which crew may be responsible for equipment neglect.

Geared to split second timing, the automatic recorder will report the proper lubrication of rig components between tours. An example of this versatility was illustrated when the tool foreman of a major company observed from the recording chart that the rig had not been greased on evening tour. With this information available, the 'pusher was in a position to make proper provisions for the elimination of such malpractice.

Personnel Training. Each driller follows a definite pattern in the process of making hole. Some drillers and prone to slack off several inches, allow sufficient time for the slack to drill off, then feed more weight to the bit. This procedure may vary weight on the bit from 35,000 to zero pounds within comparatively short intervals. In contrast, another driller will strive to maintain comparable weights on bottom at all times and, in the process, drill at a more rapid, continuous rate. The latter practice is unquestionably more efficient.

Casual observation of the automatic log will reveal the existence of either of the above conditions. When a condition of inefficient drilling practice exists, the toolpusher will be in a position to inaugurate training programs to overcome these bad habits. Without the automatic drilling recorder, collection of such facts would be impossible unless the toolpusher remained on location continuously.

Bit Performance Record: The evaluation of bit performance is not an

Rig Runner Report

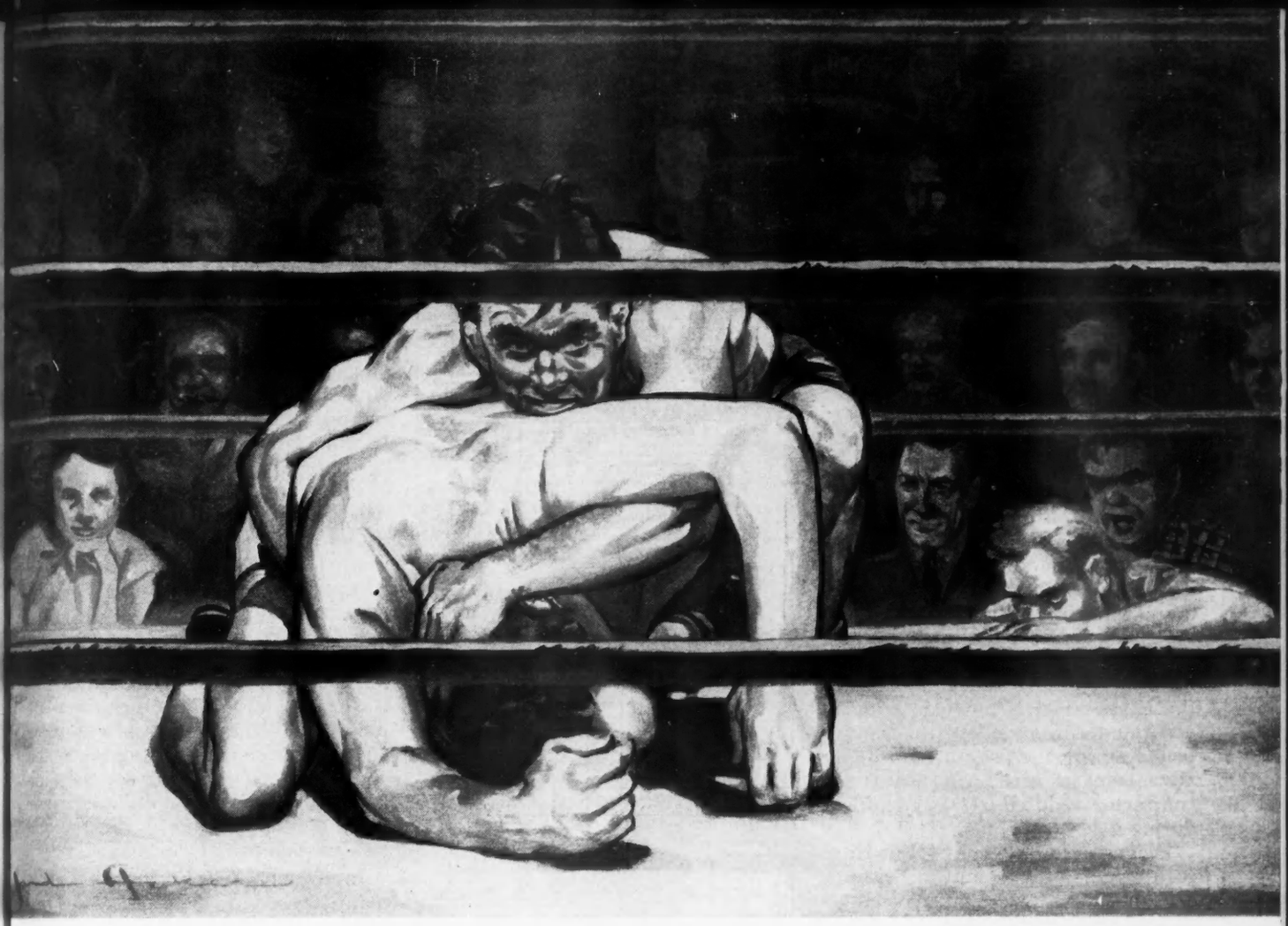
Day	Tour	Starting Depth	Ending Depth	Footage Drilled This Tour	Total Depth	Hours Drilled	Total Hours Drilled To Date	Coring, Drill Stem Test, Company Time This Tour	Waiting On Orders, Etc., Total Company Hours To Date	In-or-Out No. Hours For Trip	30′ Hour Average Rate of Penetration	Hours Run	Total Hours Lost for Repairs	Hours Lost—Rig	Hours Lost—Other	Total Hours Lost	Remarks
1	Day	5793	5793	0	5793	0	None	None	None	1¾	.....	....	6¼	6¼	....	8	Serviced motors.
	Evening	5793	5793	0	5793	0	None	None	None	1¼	.....	....	13	....	6¾	16	Cut off drilling line—reamed.
	Morning	5793	5794	1	5794	0	None	None	None	1¾	.....	....	19¾	....	6¾	24	Tight hole and reamed 210′.
	Total Drilled per Day..	....	....	1	....	....	.....	.....	.....	.....	.....	....	....	....	....	.....	
2	Day	5794	5799	5	5799	½	½	None	None	4	.....	....	....	....	3½	31½	Reaming 5410–5693.
	Evening	5799	5980	181	5980	7½	8	None	None	.....	50 Min.	13	23¼	....	½	32	Reaming.
	Morning	5980	6060	80	6060	5½	13½	None	None	2½ (O)	80 Min.	....	23¾	....	....	34½	Reaming.
	Total Drilled per Day..	....	....	266	....	....	.....	.....	.....	.....	.....	....	....	....	....	.....	
3	Day	6060	6120	60	6120	3	16½	None	None	2½ (I)	50 Min.	3	26¼	....	2½	39½	Changing pipe protectors–reset
	Evening	6120	6245	125	6245	6½	23	None	None	1 (O)	60 Min.	....	26¾	....	....	41	Rotary–Pulled 22 strands.
	Morning	6245	6274	29	6274	1½	24½	None	None	4½	65 Min.	10	28¾	½	½ Slope Test	47½	.....
	Total Drilled per Day..	....	....	214	....	....	.....	.....	.....	.....	.....	....	....	....	....	.....	
4	Day	6274	6375	101	6375	4½	29	None	None	.....	55 Min.	4½	32¼	3½	....	51	.....
	Evening	6378	6469	94	6469	5½	34½	None	None	1½	39 Min.	10	33¼	....	1	53½	.....
	Morning	6469	6545	76	6545	2½	37	None	None	4½	38 Min.	2½	34¼	....	1	59	Straighten Drill Line.
	Total Drilled per Day..	....	....	271	....	....	.....	.....	.....	.....	.....	....	....	....	....	.....	
5	Day	6545	6636	91	6636	4½	41½	None	None	1	.....	7	36¾	2½	.....	62½	Oil Lines repaired.
	Evening	6636	6658	22	6658	1¾	43¼	None	None	5½	.....	1¾	37½	¾	....	68¾	.....
	Morning	6659	6769	111	6769	6½	49¾	None	None	.....	.....	8¼	39	¾	¾	70¼	Leak in tool joint. Adjust clutch.
	Total Drilled per Day..	....	....	224	....	....	.....	.....	.....	.....	.....	....	....	....	....	.....	
6	Day	6769	6795	26	6795	3½	53¼	None	None	3 (O)	.....	11¾	40½	1½	....	74¾	Oil pump and rig.
	Evening	6795	6795	0	6795	0	53¼	None	None	0	.....	....	48½	8	....	82¾	Work No. 2 converter.
	Morning	6795	6795	0	6795	0	53¼	None	None	2 (I)	.....	....	54½	4	2 (Mud)	90¾	Work No. 2 converter and mud pump.
	Total Drilled per Day..	....	....	26	....	....	.....	.....	.....	.....	.....	....	....	....	....	.....	
7	Day	6795	6903	108	6903	7	60¼	None	None	1	.....	7	....	....	....	91¾	.....
	Evening	6903	6964	61	6964	5¼	65½	None	None	2¾	.....	12¼	....	....	....	94½	.....
	Morning	6964	7018	54	7018	4½	70	None	None	3½	.....	4½	....	....	....	98	.....
	Total Drilled per Day..	....	....	223	....	....	.....	.....	.....	.....	.....	....	....	....	....	.....	
8	Day	7018	7080	62	7080	6	76	None	None	2	.....	10	....	....	....	100	.....
	Evening	7080	7145	65	7145	4½	80½	None	None	3¾	.....	4¼	....	....	....	103¼	.....
	Morning	7145	7225	58	7225	6¼	86¾	None	None	1¾	.....	6	....	....	....	105½	.....
	Total Drilled per Day..	....	....	185	....	....	.....	.....	.....	.....	.....	....	....	....	....	.....	
9	Day	7225	7225	0	7225	0	86¾	None	None	1¾	.....	....	60¾	6¼	....	113½	Repaired oil line in gear box.
	Evening	7225	7274	49	7274	3¼	90	None	None	3	.....	3¼	62½	1¾	....	118¼	Repaired oil line in gear box.
	Morning	7074	7385	111	7385	7	97	.....	.....	.....	.....	....	63½	1	....	119¼	Rig clutch adjusted.
	Total Drilled per Day..	....	....	150	....	....	.....	.....	.....	.....	.....	....	....	....	....	.....	
216 Hours	.....	....	....	1560	....	96	1,193½	.....	.....	55¾	.....	....	64½	38¼	26¼	119¼	

29.3 percent of total time lost due to repairs.
25.8 percent of total time lost due to trips.
44.9 percent of total time drilling.

100.0 percent.

By decreasing repair by 10 percent—$786 per month or saving approximate $1.24 hour time interval per month.
Approximate $10,000 per year per rig.

Transfer of data from strip log to this simple accounting form automatically provides a continuous record of drilling and equipment operations.



YOU GET BETTER RESULTS WITH NO FRACTURING

One well completion problem you no longer have to wrestle with is the unpredictable condition at the pay zone resulting from crude perforating methods that depend on fracturing of the cement sheath in order to obtain production. By perforating with the modern Welex JET method, you get *positive penetration* through all strings of casing and cement and far back into the producing zone. Your well produces oil through an intact assembly directly from virgin formation. There is *no burr, no fracturing,* and *no debris left in the well.* Records in the operators' files on thousands of wells perforated by the Welex Jet method prove that a *known condition at the producing zone* often eliminates many problems or makes it possible to deal with them in a positive manner. Results cost less with Welex Jets.... Call your nearest Welex Station for prompt service day or night.

ORIGINATORS OF Welex JET PERFORATING

Welex
JET SERVICES INC.

GENERAL OFFICE: 3909 Hemphill Street • Fort Worth 9, Texas
FIELD STATIONS: Ardmore • Lindsay • Shawnee • Corpus Christi
Hobbs • Falfurrias • Houston • Kilgore • Odessa • Wichita Falls

intangible factor when the automatic recording device is employed. The problem of selecting the proper bit for varied drilling conditions becomes comparatively easy with the second-to-second record provided by the device. When drilling comparable formation, it is even possible to establish a yardstick indicating the optimum time to remove a bit.

The sum and total of these advantages nets the contractor more efficient bit performance plus the penetration of formation with increased speed.

Reduce 'Swab Time': It is a rule and practice for the relief driller to 'run a swab' on the driller completing a tour to ascertain all happenings which occurred during the previous eight hours. Often, the practice requires valuable rig time and in some cases the rig is actually shut down during the conversation. However, with the automatic recorder aboard, the relief driller is provided with an accurate record of all operations completed during the previous tour. This advantage in itself will assure the contractor reduced rig interruptions during a 24-hour period.

Diagnosis of Fishing Jobs: Hard rock digging often results in twistoffs. Sometimes the condition is not immediately recognized by the driller and the rotating pipe may drill down beside the fish. A dangerous condition, the possibility of a second twistoff prevails. In the event this condition occurs, the process of fishing will become complicated.

Close inspection of the recorder chart will advise the driller of the development of this condition. Since the instrument is so sensitive that the chart will show when a crew member rides the elevators to the board, the severing of the drill string by twistoffs is immediately indicated. Hence, the observant driller will virtually eliminate the possibility of drilling past a fish and the entire operation will be expedited by the immediate removal of drill pipe to begin fishing operations.

Coordinates Geological Instruction: Time drilling is of basic importance in many areas, a technique greatly aided by the time recording device. Employment of the device informs the geologist, toolpusher and driller of instantaneous changes in drilling rates, the net result being a better coordination of geological instruction and rig operation.

Aside from offering the advantage of recorded drilling breaks, the device also permits accurate determination

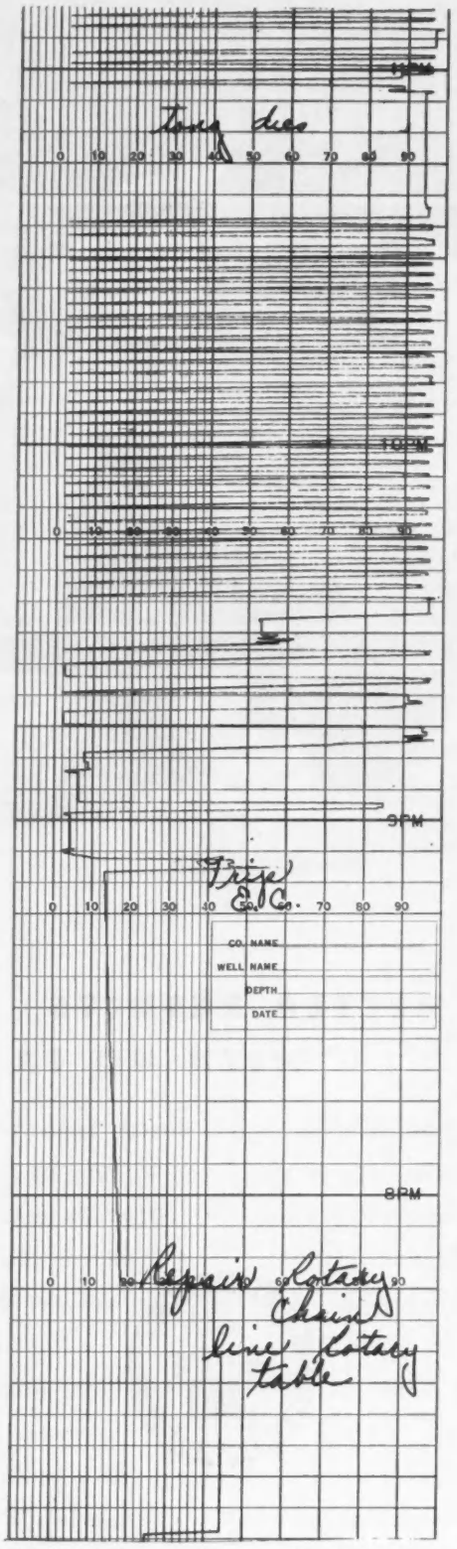


FIGURE 2. Sample of automatic drilling time log. Rapid inspection will permit evaluation of drilling, trip and rig down-time.

FIGURE 3. Warning signal suspended over the drawworks. When the traveling block nears the crown, a blast from the horn cautions the driller.

of sample lag, another factor of particular advantage to the geologist.

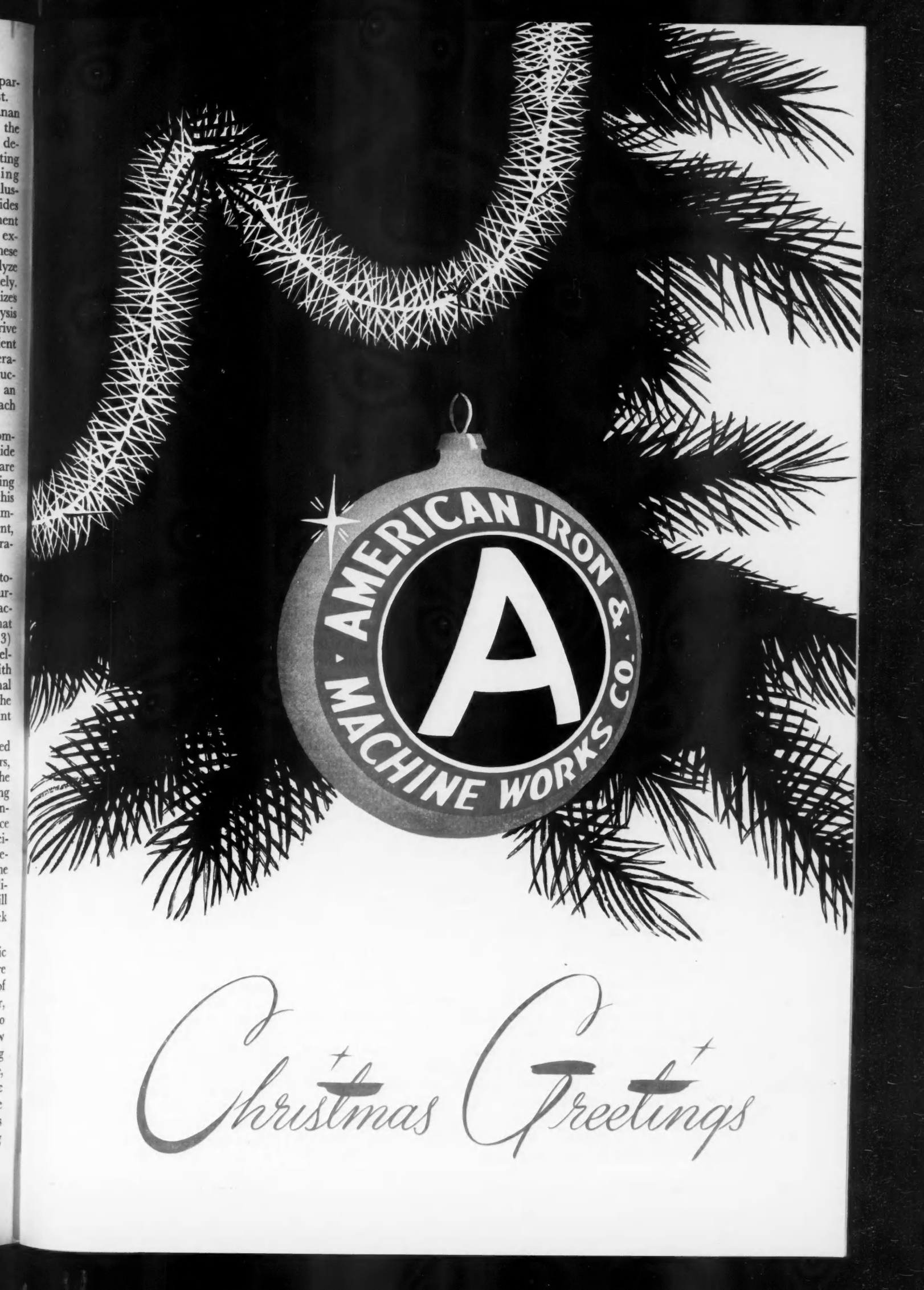
Simplified Accounting: Buchanan has increased the versatility of the automatic drilling log through the development of a simplified accounting record which reflects an exacting analysis of drilling record data. Illustrated in Figure 2, this form provides space for the entry of all pertinent drilling data, down-time and an explanation of repairs made. With these data available, it is possible to analyze rig operational expenses accurately. In turn, each toolpusher recognizes a competitive basis for the analysis of down-time expenses and will strive to assist and train crews in efficient equipment maintenance and operation. The result is an over-all reduction of down-time charges with an accompanying increased footage each day.

Except for the bit record and comments shown on the right hand side of the tabulation, all other data are reflected by the automatic recording chart. Transferring the data to this analysis sheet, the contractor is immediately in possession of an efficient, easily maintained record of rig operation vs. equipment performance.

Increased Safety Factor: The automatic recording device, beside furnishing a complete record of rig activity, affords a safety feature in that the blast from a horn (Figure 3) warns of the proximity of the traveling block to the crown. Equipped with a setting device, the warning signal can be adjusted to operate when the traveling block nears a danger point above the board.

Although the industry is blessed with well trained, high caliber drillers, serious accidents still occur when the crown is rammed with a traveling block. A split-second drift of attention will often result in the occurrence of this damaging, man-killing accident. However, with a warning device operating in conjunction with the recorder, the operator is given additional assurance that the driller will be warned before the traveling block crashes into the crown.

No Tattle Tale: That automatic drilling time recording devices were 'tattle tales' was an early opinion of the average drilling crew. However, the day has arrived wherein, due to a highly competitive spirit, each crew is eager to sustain the outstanding record. With this attitude in force, Buchanan reports that the automatic recorder is recognized as a helpmate rather than recorder of mistakes which inevitably occur on a drilling rig.


AMERICAN IRON & MACHINE WORKS CO.
A
Christmas Greetings

Wilshire Conducts Second

Spraberry Air Drilling Venture

By O. H. BERRY, JR., and WM. QUEENSBURY, JR.
Wilshire Oil Company, Inc., Midland, Texas

SPRABERRY COMPLETION research continues as Wilshire Oil Company, Inc., conducts the second air drilling project in Upton County, Texas. Here is a short description of this venture, which progressed with encouraging success. A novel application of flow valves eliminated the accumulation of bottom hole fluids in this particular operation.

A SECOND experimental air drilling project is being conducted by Penntex Oil Corporation and Wilshire Oil Company, Inc., in Upton County, Texas. The first Wilshire air drilling was conducted at Penntex Oil Corporation's Ragland 1, Martin County, and resulted in drilling 922 feet of formation which proved barren after simulative measures were performed.[1]

The second experiment is being conducted at a North Pembrook development well, Wilshire Oil's Hunt 5-21, Upton County. Currently delayed because of a fishing job, the second air drilling project successfully penetrated 108 feet of formation below the oil string. There is a 400-foot oil column in this hole, and during drilling operations oil was continuously jetted from the hole at an approximate rate of ten barrels per hour from 7185 feet to 7198 feet, where a fishing job occurred.

There is no illusion that air drilling is in itself the optimum means of completing a well in the Spraberry Sands. Efforts in this connection are with the view of formulating and evaluating a completion technique which may afford the advantages of cable tool drilling at rotary rates of penetration. Moreover, air circulation may prove applicable in overcoming lost circulation problems and in the coring of depleted and semi-depleted reservoirs in conjunction with secondary recovery studies. Results suggest the mechanical practicability of air as a circulating fluid, and time may provide at least a partial answer as to the merits of this completion practice.

Essentially the same hookup is being used in Upton County with the exception that three 500-cubic feet per minute two-stage compressors have supplanted the ten smaller compressors. This equipment was tied into a series of manifolds and an after-cooler. During normal drilling operations, delivery averaged 900,000 cubic feet per day at approximately 200 pounds per square inch gauge and 150° F. For future work Wilshire has on order one 200 brake horsepower two-stage compressor sized to deliver 1¼ Mcf per day at 380 pounds per square inch gauge discharge. Availability influenced the selection of this particular piece of equipment.

Surface pressure control equipment on both jobs consisted of a manually controlled master valve, two hydraulically controlled blowout preventers (one equipped with blank rams), one hydraulically controlled flow line valve, and a rotating stripper head. Subsurface pressure control equipment was incorporated in the Upton County drilling string. This affords a means of plugging the drilling string for the purpose of making a connection or a trip if the well should commence to flow naturally. A landing nipple was run in the lower portion of the string, whereas a plugged modified mandril could be lubricated and seated for a shutoff.

At the Upton County job, 81 feet of formation below the oil string was drilled in nine hours, using reverse circulation. A string of 2½-inch tubing with two 4½-inch drill collars was rotated from 50 to 60 revolutions per minute carrying 10,000 pounds on a 5⅝-inch rock bit. The average surface air pressure was 250 psi and the volume rate was approximately one Mcf per day. The bit was pulled after 81 feet for inspection and it was found in fairly good condition. No abnormal wear appeared to have occurred in the bearings. The second bit of this type cut 19 feet in two hours before plugging at a depth of 7190 feet. Upon pulling this bit, two stands of oil were recovered and, undoubtedly, the plugged bit and bottom drill collar resulted from this initial fluid.

Top of the first Spraberry sand was encountered at 7148 feet by sample correlation, but no odor of gas or oil staining was noted until 7185 feet was reached. Conventional rock bits were run, but each became plugged before any hole could be cut. Then a skirted rock bit was substituted and eight feet of hole was drilled in two hours, at which time the tubing twisted off at 5750 feet.

In drilling the shale sections below the casing seat and above the Spraberry sand top in both wells, a small amount of drilling mud was detected in the air discharge. This fluid could have possibly leaked from behind the oil string, or could have resulted from vertical fracturing through the casing seat.

In weighing the different problems encountered in these operations, the plugging tendency of the drill collars and the bit at the Upton County job has been of greatest concern. No difficulty was experienced with circulation in drilling from the casing shoe at 7090 feet to a depth of approximately 7185 feet, where oil was first noted in the flow lines. The tubing did not plug, nor did it contain any adhering particles; however, on two

• CONTINUED ON PAGE 133

Appraisal of Drilling Mud Costs

Part 1

By VICTOR V. HORNER

Baroid Sales Division, National Lead Company, Tulsa

MUCH TIME and consideration have been given the proper selection of materials and the exacting control of drilling mud characteristics; however, little attention has been devoted to the development of a simplified system for calculating mud costs. With this thought in mind, the author has improvised an accurate and simple method for the rapid determination of drilling mud costs. This method offers the operator a standard calculation useful in the determination of mud bills during or at the completion of an operation.

COMPARISON of total well cost or cost per foot of hole drilled is common practice in appraisal of mud costs. However, such comparison frequently fails to recognize seemingly minor variables which may, as will be shown later, have a major influence on total cost.

It is the purpose of this discussion to outline a method of cost analysis which may be applied in reviewing individual well mud costs for proper appraisal. The effect of small changes in mud specifications on total mud costs, which can be used to explain these costs, will be illustrated. The analytical approach used in this discussion will show that a 0.3 pound per gallon decrease in a native mud weight, which is often vitally necessary in the control of loss of circulation, could, in a typical case, result in a cost increase of more than 18 percent. Likewise, a reduction in filter loss from ten to six cubic centimeters, which is frequently required to improve hole conditions, is shown to conceivably effect an increase of 40 percent in total mud cost while the 0.3 pound per gallon weight alteration combined with the ten to six cubic centimeters filter loss adjustment could result in a total cost increase of more than 70 percent.

In addition, total mud costs of $15,000 and $6799 for two wells drilled in a common area are compared. By considering the factors which influence mud costs, the analytical method will show that the mud costs of the two wells were reasonable despite the great difference in their total amount.

This discussion concerns only low weight muds. This analytical approach could be applied to weighted muds if additional factors beyond the scope of this paper were considered.

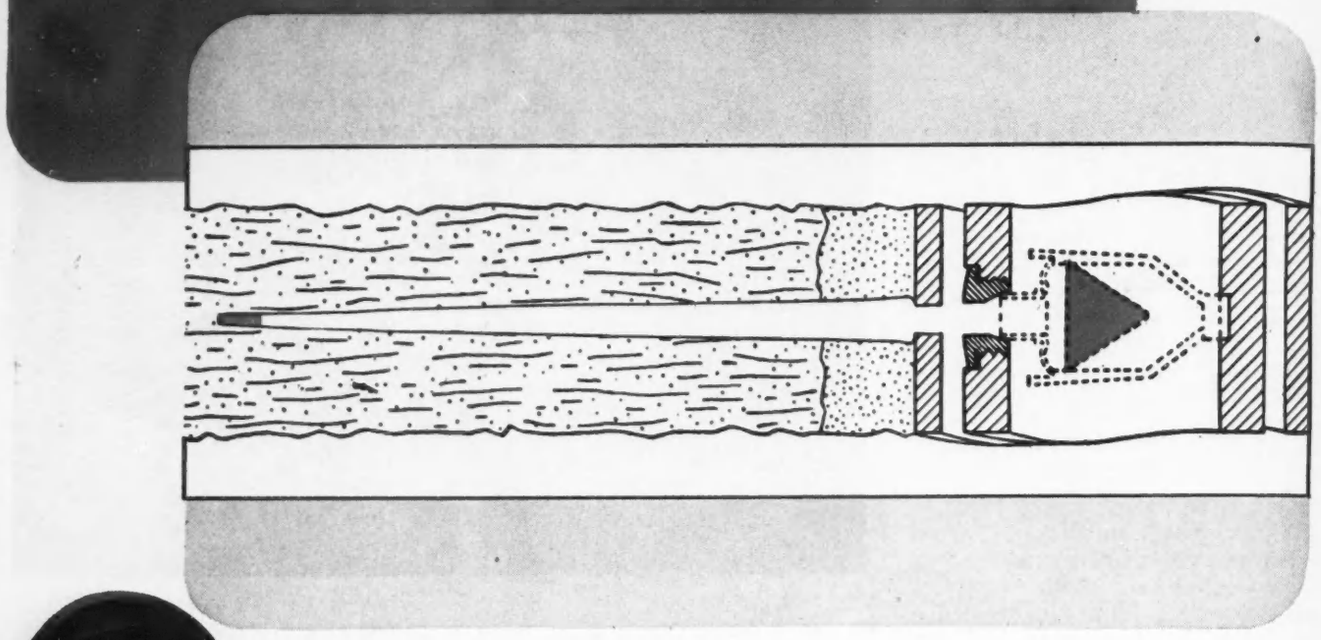
Cost Analysis Method

For analytical purposes, total mud costs are divided into three components:

1. Final Mud Volume Cost
2. Miscellaneous Cost
3. Maintenance Cost

Final Mud Volume Cost is the value of the mud in the circulating system at a designated depth and is equivalent to the system volume times the unit cost per barrel of mud. The system volume is the sum of the hole volume and the surface circulating pit volume. The unit cost (per barrel) is the value of the mud material required to modify the native mud

NO HIT-OR-MISS PERFORATING WITH DU PONT JET PERFORATORS



They assure positive penetration with every shot fired

OIL MEN agree Du Pont Jet Perforators are the most effective perforating tools the industry has ever known. These Jets assure certain penetration with every shot . . . promote a greater flow of oil. Jet Perforators contain high-explosive, shaped charges with the penetrating power needed to cut through one, two, and even three strings of N80 casing, neat cement, *and* deep into the surrounding formation. Du Pont Jets easily pierce well beyond mud damage zones . . . up to three times deeper than other methods.

Jet Perforators are precision-made, and their manufacture is laboratory controlled to insure uniformity. They can be fired simultaneously in pre-loaded carriers containing as many as 75 Perforators . . . making symmetrical patterns a certainty. You can always be sure of the results. Jets do a clean job, too . . . leave no burrs or other obstructions to hinder lowering of tools. And, they also perform perfectly in "hot wells."

If the oil is there, Du Pont Jet Perforators will reach it. So, to be sure of the best possible results on your next perforating job, give your service company the OK to use these Jets. You'll appreciate the job they do . . . and the time and money they save. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

DU PONT EXPLOSIVES

Blasting Supplies and Accessories

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

to a mud having the characteristics of the final mud.

•

••Final Mud Volume Cost=
[Hole Volume (bbl) plus Pit Volume (bbl)] × Unit Mud Cost dollars/barrels)

Miscellaneous Cost is the value of mud materials which are excluded from the final mud volume, i.e.

(a) Spud Mud
(b) Loss of Circulation Mud Volume and Materials
(c) Chemicals used in treating soluble contaminants originating in the formation or cement. (Note: chemical cost to treat make-up water contaminants is considered maintenance cost.)

Maintenance Cost is the value of the mud material used to maintain a treated mud system to given specifications for the number of days the mud is in use and is equivalent to:

Total Mud Cost minus (Final Mud Volume Cost plus Miscellaneous Cost)

Cost of mud materials used for maintenance are represented by the value of mud discarded to reserve pits and lost by normal surface wastage. This mud occurs as drilling proceeds through the additions of water required for maintenance of viscosity and weight. Viscosity and weight increases result from the continual addition of low specific gravity solids which occur through drilling action. Each barrel of new mud resulting from the addition of water and formation solids (excluding solids removed over shale shakers or in circulating pits) must be treated with the proper agents to condition the barrel of new mud to the same properties as the mud in the original system. Consequently, maintenance cost is related to the amount of daily water dilution and the cost of conditioning the additional volume of native mud to the specified mud properties. Therefore, maintenance cost is equal to:

Average Mud Volume (barrel) × Dilution Factor (percent) × Unit Mud Cost (dollars/barrels) × number of days.

Average Mud Volume (barrel) × Dilution Factor (percent) × Unit Mud Cost (dollars/barrels) × number of days.

The dilution factor is defined as the average amount of new mud formed per day through addition of formation solids and the water used for maintenance.

Application of Cost Analysis Method

To illustrate the application of this analysis method, an example is presented. The example is purposely simplified for applying this method to individual well mud costs.

About the Author

VIC HORNER graduated from the University of Tulsa in 1935 with a B.S. degree in petroleum engineering, and spent ten years with The Carter Oil Company as petroleum engineer, district drilling engineer, and district petroleum engineer with assignments in Oklahoma, Kansas, Illinois, Louisiana, Montana and Wyoming. In 1945 he joined Baroid Sales Division, National Lead Company, with assignments in Illinois and the Rocky Mountain area, followed by a year in Alberta. After returning from Canada in 1948 he was assigned to Baroid's Mid-Continent Division staff in Tulsa as assistant division field engineer. A year later he assumed duties of division field service engineer, Mid-Continent Division, which position he now holds.

Assume the following:

1. Hole drilled with nine-inch bit from 2000 to 6000 feet in 20 days with controlled average mud characteristics of 10 pound/gallon weight (maximum), 40 seconds API viscosity and ten cc filter loss.
2. Hole volume assumed to be 150 percent of theoretical nine-inch hole volume. Circulating pit volume 400 barrels.
3. Make-up water carried calcium sulfate, but no soluble formation contaminants encountered.
4. Forty sacks of bentonite ($80) used as spud mud in drilling and setting surface casing through unconsolidated surface strata.

The operator invoiced for the following materials:

Bentonite	$1,468
Quebracho	485
Caustic Soda	174
Soda Ash	173
TOTAL	$2,300

1. Estimated Final Mud Volume Cost = (Final hole volume plus pit volume) × Unit Mud Cost.
   a. Hole Volume =
   $9^2 \times 6 \times 1.5 = 729$ barrels
   Pit Volume = 400 barrels
   Final Mud Volume 1129 barrels
   b. Unit Mud Cost:

It is assumed that to reduce the filter loss of the native mud to ten cubic centimeters filter loss and to provide a viscosity of 40 seconds, would require:

1	lb/bbl Soda Ash,	
	or a cost of	$0.05 per barrel
¾	lb/bbl Caustic Soda,	
	or a cost of	0.05 per barrel
¾	lb/bbl Quebracho,	
	or a cost of	0.14 per barrel
20	lb/bbl Bentonite,	
	or a cost of	0.40 per barrel
22½	lb/bbl	$0.64 Unit Cost/barrel

   c. Therefore, the final mud volume cost would be equal to $1129 \times \$0.64 = \$7.23$
2. Miscellaneous Cost = 40 sacks bentonite = $80
3. Maintenance Cost = $2300 — ($723 plus $80) = $1497

For purpose of this analysis, it is to be noted that original "mudding-up" cost and mud make-up cost for additional hole volume while drilling from 2000 to 6000 feet are included in the estimated final mud volume. Any mud volume added to the system beyond that remaining at the completion of the hole, unless separated as a miscellaneous cost item, such as loss of mud to the formation, is included in maintenance cost. Mud jetted from circulating pits to reserve pits is classified and included in maintenance cost.

Therefore, the maintenance cost of $1497 in this case represents the amount expended to maintain the ten pound/gallon, 40 second viscosity, ten cubic centimeter filter loss mud for 20 days while drilling from 2000 to 6000 feet. As stated before, maintenance cost is also equal to:

Average Mud Volume (barrels) × Dilution Factor (percent) × Unit Mud Cost/barrels × Number of Days.

1. Mud Volume at 2000′ =
   $(9^2 \times 2 \times 1.5$ plus 400 =
   643 barrels
   Mud Volume at 6000′ =
   $9^2 \times 6 \times 1.5)$ plus 400 =
   1129 barrels
   Average Mud Volume

(2000 to 6000 feet) = 886 barrels

2. Unit Mud Cost for a 10 cubic centimeter filter loss mud was previously estimated at $0.64 per barrel.

3. Number of days on mud = 20

Therefore:

886 × Dilution Factor (percent) × $0.64 × 20 = $1497

And:

$$\text{Dilution Factor} = \frac{\$1497}{886 \times \$0.64 \times 20}$$

= 13.2 percent of the Average Mud Volume (from 2000 to 6000 feet)

Or:

.132 × 886 = 117 barrels of new mud prepared per day.

Entrainment of Insoluble Mud Solids as Related to Water Dilution

As hole is made with any drilling fluid, low specific gravity (2.5 plus) formation solids become entrained in the mud. A large amount of the solids are separated from or settled out of the mud in the surface system. The remaining solids, suspended in the mud, have several effects, among which are weight and viscosity increases. These increases are directly related to the yield of the entrained solids. Yield is expressed as the barrels of 15 centipoises of mud obtainable from a ton of these solids. If the entrained solids are from low yield shales (10 barrels per ton), the tendency of the mud is to increase slightly in viscosity and rapidly in weight. On the other hand, if the solids are from higher yield shales (30-40 barrels per ton) the mud tends to increase more rapidly in viscosity and slightly in weight. In either case, water must be added, to maintain the mud system while drilling, for control of weight and viscosity.

In the example case, as the ten pound per gallon, ten cc filter loss mud is used to drill below the "mudding-up" depth of 2000 feet, the entrance and entrainment of low yield, low specific gravity solids will tend to increase the unit mud weight. As previously described, for the addition and entrainment of a certain amount of low yield native shale solids in the circulating mud, water will be necessary to maintain the weight of the original mud at ten pounds per gallon. Also, the volume of new mud resulting from the water addition and solids must include the necessary additives to condition the native mud properties to 40 sec. viscosity and ten cc filter loss.

The amount of solids contained in one barrel of mud consisting of 2.5 specific gravity solids and water can be calculated as follows:

Pounds of 2.5 specific gravity solids = 70 (W — 8.33)

Where:

W = weight of mud (pounds per gallon)

From this it can be determined that one barrel of ten pounds per gallon mud contains 117 pounds of 2.5 specific gravity solids. However, it was assumed that 20 pounds per barrel of bentonite, plus 2½ pounds per barrel of chemicals were required to condition this mud to the same characteristics as the system. Consequently, 117 minus 22.5 (assuming 2.5 specific gravity for the bentonite and chemicals) = 94.5 pounds of formation solids contained in each barrel of the ten pounds per gallon mud under discussion.

In the preceding example, it was found that 117 barrels per day of new mud were formed while maintaining a ten pounds per gallon, 40 sec. viscosity, ten cc filter loss mud. Therefore, 117 × 94.5 pounds represents 11,057 pounds, or more than 5½ tons, of formation solids per day entering and becoming a part of the circulating mud system. It should be appreciated, here, that poor settling facilities in surface pits, and drilling practice which promotes rapid solid buildup from drill pipe erosion, certainly influence mud costs.

Use of the above analytical approach makes it possible to account for mud expenditures and to recognize the effect upon total cost of altering specified physical mud characteristics as will be shown as follows:

Adjustments in Mud Properties and Effect on Mud Costs

WEIGHT ALTERATION:

Assume that a 9.7 pounds per gallon weight specification had been followed in the example case instead of ten pounds per gallon. Viscosity and filter loss remained the same. One barrel of 9.7 pounds per gallon unweighted mud contains 96 pounds of 2.5 specific gravity solids as compared with 117 pounds in a barrel of ten pounds per gallon mud. As before, it was assumed that 22.5 pounds per barrel of bentonite and chemicals were required to prepare the native mud to ten cc filter loss and 40 sec. viscosity. Consequently, each 73.5 pounds (96 minus 22.5) of formation solids added to the mud and entrained in the system would result in one barrel of new mud. And the average volume of new mud formed each day by the addition of water for maintaining the mud weight at 9.7 pounds per gallon would be:

$$\frac{\text{11,057 lb./day of formation solids}}{73.5} = 150 \text{ barrels}$$

With the unit mud cost $0.64 (for ten cc filter loss, 40 sec. viscosity) the total mud cost would be:

Final Mud Volume Cost = 1129 × $0.64 =	$ 723
Miscellaneous Cost (40 sacks bentonite) =	80
Maintenance Cost = 150 × 20 × $0.64 =	1,920
Total Mud Cost	$2,723

This increased cost of over 18 percent above the $2300 total cost of the ten pounds per gallon mud is entirely due to increased maintenance materials required to maintain a 9.7 pounds per gallon mud.

Note this mud cost increase for only 0.3 pound per gallon weight alteration. This small difference in unit mud weight is within the discrepancy range of many rig mud balances. This is especially true where mud balances are not checked because unit mud weight is not considered important unless for formation pressure or loss of circulation control.

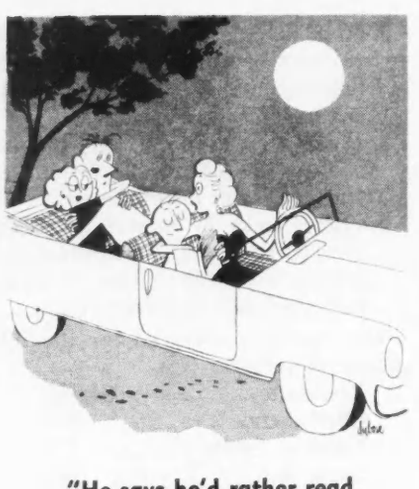
FILTER LOSS ALTERATION:

Assume that a six cc filter loss specification had been followed in the example case instead of ten cc, weight and viscosity remaining the same.

It is assumed that to reduce the filter loss of the native mud to six cc filter loss and to provide a viscosity of 40 seconds would require:

1	lb./bbl. Soda Ash,	
	or a cost of $0.05 per barrel	
1¼	lb./bbl. Caustic Soda,	
	or a cost of 0.09 per barrel	
1¼	lb./bbl. Quebracho,	
	or a cost of 0.23 per barrel	
25	lb./bbl. Bentonite,	
	or a cost of 0.50 per barrel	
28½ lb./bbl.		$0.87
		Unit Cost per barrel

As stated previously, one barrel of



"He says he'd rather read WORLD OIL."

ten pounds per gallon mud contains 117 pounds of 2.5 specific gravity solids. However, it is assumed that 28.5 pounds of bentonite and chemicals, as shown above, are required to condition one barrel of the native mud to six cc filter loss and 40 sec. viscosity. Consequently, every 88.5 pounds (117 minus 28.5) of formation solids added to the mud and entrained in the system would result in one barrel of new mud. The average volume of new mud formed each day by the addition of water for maintaining ten pounds per gallon mud would be:

$$\frac{\text{11,057 pounds per day of formation solids}}{88.5} = \text{125 barrels}$$

With the unit mud cost of $0.87 per barrel for the six cc, 40 sec. viscosity mud, the total mud cost would be:

Final Mud Volume Cost = 1129 × $0.87 =	$ 982
Miscellaneous Cost (40 sacks bentonite) =	80
Maintenance Cost = 125 × 20 × $0.87 =	2,175
Total Mud Cost	$3,237

This total cost increase of over 40 percent above the $2300 cost of the ten pounds per gallon, 40 sec. viscosity, ten cc filter loss mud is again due to increased maintenance materials required to condition the greater mud volume to the lower filter loss.

Weight and Filter Loss Alteration:

Assume that a 9.7 pounds per gallon and a six cc filter loss specification had been followed in the example case viscosity remaining the same.

In this case, both the dilution factor and unit mud costs are greater. As stated previously, one barrel of 9.7 pounds per gallon mud contains 96 pounds of 2.5 specific gravity solids and 28.5 pounds per barrel of bentonite and chemicals are required to condition the native mud to six cc filter loss and 40 sec. viscosity. Consequently, every 67.5 pounds (96 minus 28.5) of formation solids entrained in the system would result in one barrel of new mud. The average volume of new mud formed each day by the addition of water for maintaining 9.7 pounds per gallon mud weight would be:

$$\frac{\text{11,057 pounds per day of formation solids}}{67.5} = \text{164 barrels}$$

With the unit mud cost of $0.87 per barrel for the six cc, 40 sec. viscosity mud, the total mud cost would be:

Final Mud Volume Cost = 1129 × $0.87 =	$ 982
Miscellaneous Cost (40 sacks bentonite) =	80
Maintenance Cost = 164 × 20 × 0.87 =	2,854
Total Mud Cost	$3,916

This total cost increase of over 70 percent above the $2300 cost of the original example mud is again due to the increased cost of maintaining the altered specifications.

This examination not only illustrates the magnitude of mud cost increase effected by comparatively small adjustments in mud properties, but also identifies those factors which materially influence mud cost. One other obvious factor which should be considered is the number of days mud is used.

It is not the intent to suggest by this example case that all such adjustments in mud properties would effect such marked cost increases. However, all assumptions in the example case could compare with actual field operations.

In addition, it is not the intent of this examination to imply that weight increases due to solid buildup are always costly. If it is not necessary to control the mud to a specified weight, viscosity and filter loss, water additions may be reduced thus reducing cost. However, such solid increases are frequently detrimental to other mud properties and some water additions are always necessary.

In actual field practice, unit mud costs and daily water dilution factors vary from depth to depth. Particular mud treatments may alter unit mud cost for a hole interval; however, knowing the cost of mud material or the daily water consumed through any drilling interval, either dilution factors or unit mud costs may be approximated. Unit mud costs can be correlated with pilot testing for analysis of mud maintenance costs. Accurate field measurements can determine unit mud costs and dilution factors where critical economic studies are advisable.

Certain assumptions, such as hole size, and unit mud costs have been made in illustrating the analytical method and applying it to well mud cost evaluations. In practical application, values for such variables can be estimated through investigation and persistence.

(First of Two Parts)

Air Drilling Venture

• CONTINUED FROM PAGE 126

occasions, after reaming to bottom, the lower drill collar and bit were plugged. In an effort to alleviate this condition a skirted rock bit was run. It was hoped that the skirted rock bit would force all particles through the bit cones, thus reducing the size of the cuttings and eliminating the plugging condition. It is impossible to determine the exact benefits of this skirted bit due to the twistoff.

No plugging of this type was noted at the Martin County well; however, the tubing was plugged on several occasions due to an adherence of particles up and down the tubing string. Only a very small amount of fluid entered this well while entrance of fluid into the Upton County well was at a rate of ten barrels of oil per hour.

The laborious and time-consuming task of unloading the hole of fluid was solved by the introduction of three pressure flow valves in the drill string at depths of 5000, 5900, and 6600 feet. These valves, set at opening pressures of 550, 525 and 515 psi, respectively, unloaded a 2100-foot oil column from a total depth of 7200 feet in three hours following a trip.

The education of the drilling crew personnel to the problems encountered with air as a circulating medium has been a minor problem. Operation of various valves and the bleeding-off of large volumes of air at high pressures required close supervision until the crews had become indoctrinated. No injuries have occurred.

The question usually arises as to the hazards involved in drilling with air. Before operations were commenced, an insurance company was consulted as to coverage of the rig insofar as increased risks were concerned. They assured that the use of air was of no greater danger, in their opinion, than the use of oil. Probably the only real danger lies in the discharged oil spray. To lessen this fire hazard, floodlights have been mounted around the rig at distances of 100 feet, allowing all rig lights to be extinguished, and the well effluent is directed to an open vessel approximately 500 feet away from the rig.

Results obtained by an empirical approach and trial and error means at the well site are sufficiently encouraging to justify further investigation of air circulation as an aid in completion practice.

REFERENCE

[1] O. H. Berry, "Air Drilling the Spraberry Sand," WORLD OIL, p. 169, September, 1951.

THE SHIELDED-ELECTRODE METHOD

By HUBERT GUYOD
Consultant, Houston

IT IS generally difficult to determine the resistivity of the individual beds of a broken formation when logging with the conventional multiple-electrode arrangements because of the current distortion caused by the adjacent layers. This shortcoming can be overcome in certain cases by using a shielded-electrode (sometimes called also guard-electrode), i.e., an arrangement which focuses horizontally the current sent in the ground, so that the influence of the formation situated above and below the electrode is greatly minimized.

IT IS FREQUENTLY impossible to determine the true resistivity of the individual beds of a broken formation from conventional multiple-electrode resistivity graphs because there are not enough data available at the present time to properly correct the field measurements. To remedy this shortcoming the logging companies introduced recently a new tool, the shielded-electrode, which has proved valuable in some instances.

Principle of Shielded-Electrode Method[1, 2]

Referring to Figure 1, C is a long metal cylinder centered on the bore axis and connected to a source of current J whose other terminal is grounded at G, far from C. When the cylinder is placed in a formation of uniform resistivity the current leaves C as shown by the interrupted lines. If the current paths leaving the center section E of the cylinder are considered, it can be seen that they are nearly straight lines radiating almost horizontally from E. They are comprised between two surfaces I and I′ which are flat and horizontal near E but which spread more and more when the distance from E increases.

Suppose now that C is made of three independent parts, as shown by Figure 2: center section E, section S situated above E, and section S′ situated below E. If these three parts are kept at the same potential the current distribution represented on Figure 1 is not changed, i.e., the current leaving the center section E is still comprised within the surfaces I and I′. The resistance R offered by the formation to the electric current to flow from section E to the far-away ground G is proportional to the resistivity of the formation in which the cylinder is situated. A measurement of this resistance will therefore give the resistivity of the material comprised between the surfaces I and I′.

Because the current radiates away from E, the current lines are very crowded near E, but they spread more and more when the distance from E increases, although they remain substantially horizontal and are confined between surfaces I and I′. The portion of the ground situated near E contributes therefore the greatest part of this resistance, while the portions farther and farther away contribute less and less until, beyond a certain distance from E, the resistance is negligible because of the tremendous cross-sectional area offered to the current. For the sake of simplification it will be assumed first that the resistance measurement is related only to the material comprised within the double-concave volume V limited by bases II′ and by the lateral surface of a cylinder F whose radius is approximately equal to 50 times the radius of E.

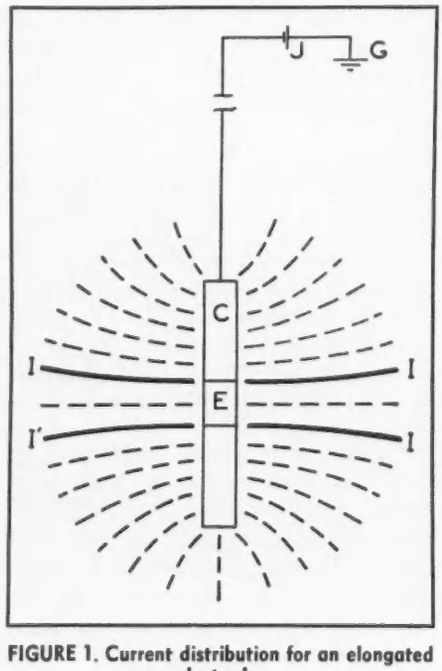


FIGURE 1. Current distribution for an elongated electrode.

Suppose now that, instead of being uniform, the formation consists of horizontal beds of different resistivity. The current distribution in the ground may occasionally be somewhat different from what it is on Figure 1, but nevertheless the resistance R offered by the formation to the current leaving section E will be proportional to a weighted average resistivity of the material comprised within volume V. In practice, this resistance is measured continuously while the exploring device is run in the hole, and the recording instrument is calibrated to give directly the apparent resistivity of the ground.

In the following, section E will be called the electrode, and section SS′ the shields. If there would be no shields, the current leaving electrode E would spread in every direction, as shown by Figure 3, but when shields having potential equal to, or somewhat greater than, the potential of E are placed above and below the electrode, the current which they emit repulses the current lines of E which are thus compelled to remain substantially horizontal up to a great distance from the bore hole.

Elementary Theory of Shielded-Electrode Method

Let L be the total length of cylinder SES′ of Figure 4, D_e its diameter, and H the height of electrode E. It can be proved that, for all the practical purposes of the shielded-electrode method, cylinder SES′ is equivalent to the metal ellipsoid of revolution E′ whose axes are equal to L and D_e, respectively. The equation of this ellipsoid is:

$$\frac{4x^2}{D_e^2} + \frac{4y^2}{D_e^2} + \frac{4z^2}{L^2} = 1 \qquad (1)$$

Merry Christmas

from Tarring Terry and all the Johnston gang

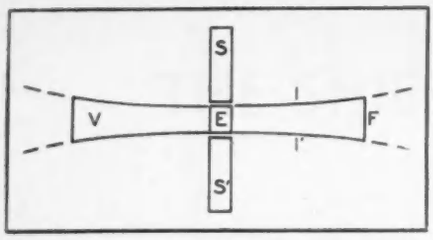


FIGURE 2. Principle of the shielded-electrode.

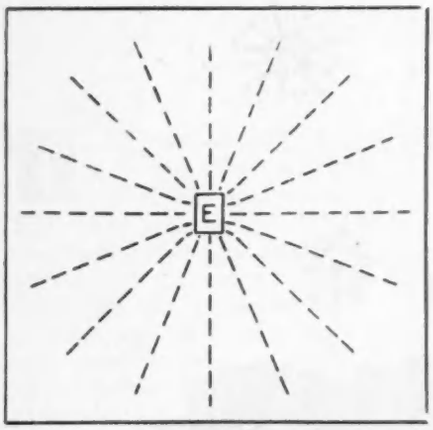


FIGURE 3. Current distribution for a short electrode.

When this ellipsoid is placed in a medium of uniform resistivity R_f and connected to a power source, the equipotential surfaces are ellipsoids of revolution having the same focal points as those of E′, and the current nappes are hyperboloids of revolution having also the same focal points. The current leaving electrode E is comprised between the two nappes I and I′ of the hyperboloid H whose equation is:

$$-\frac{4x^2}{B^2}-\frac{4y^2}{B^2}+\frac{4z^2}{H^2}=1 \quad (2)$$

in which $B^2=L^2-D_e^2-H^2$

The resistance R offered by the current leaving electrode E can be calculated as follows. Referring to Figure 5, D represents a cylinder coaxial with the electrode and comprised between the two nappes I and I′. Let r denote its radius and l its height. The resistance dR offered to the current flowing from cylinder D to a similar cylinder D′ of radius r + dr is:

$$dR=R_f\frac{dr}{2\pi lr}=\frac{R_f}{2\pi ll}\times\frac{dx}{\sqrt{\frac{4x^2}{B^2}+1}} \quad (3)$$

The resistance from distance r to any other distance r′ is:

$$R=\int_r^{r'}dR=\frac{2.3R_f}{2\pi H}\left[\log\frac{\sqrt{4r'^2+B^2}-B}{\sqrt{4r^2+B^2}-B}-\log\frac{r'}{r}\right]=R_f\,f(r',r) \quad (4)$$

in which the dimensions are expressed in meters and the resistivity in ohmmeters.

Equations 2 and 4 are for the case of a medium of uniform resistivity. If the formation in which the exploring device is situated is not uniform, they apply very well also provided the bed under survey is thick with respect to the height of electrode E, because in this case there is no appreciable current distortion within the nappes I and I′. This will be assumed in the following unless specified otherwise.

Effect of Shield Length

To obtain a detailed log it is advisable to keep the height of the electrode small—one foot, for example. Inasmuch as the electrode diameter is of the order of four inches, it will be here assumed that $H=3D_e$. Hence, the intersection of hyperboloid H and the plane of the figure is the hyperbola having the following equation:

$$-\frac{4x^2}{L^2-10D_e^2}+\frac{4z^2}{9D_e^2}=1$$

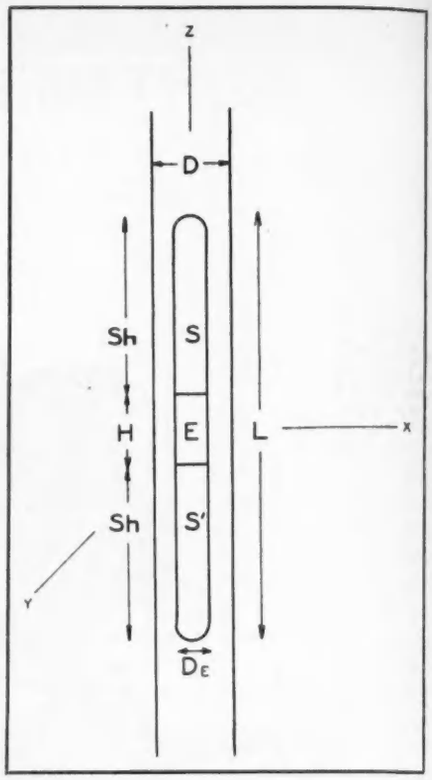


FIGURE 4.

Figure 6 represents four such hyperbolas corresponding to $L=5D_e$, $10D_e$, $15D_e$ and $20D_e$, i.e., to shield lengths Sh equal to D_e, $3.5D_e$, $6D_e$ and $8.5D_e$ respectively. It can be seen that, the longer the shield, the flatter the current sheet leaving electrode E. There is considerable spread for short shields, but not too much spread for shield lengths greater than about $8D_e$. Little is gained by increasing the shield length beyond $8D_e$, unless extremely long shields are used. A shield length equal to 7.5 D_e corresponds to $L=18D_e$, i.e., to an over-all instrument length of the order of 6 feet.

Note that the current sheet is absolutely flat and horizontal when the

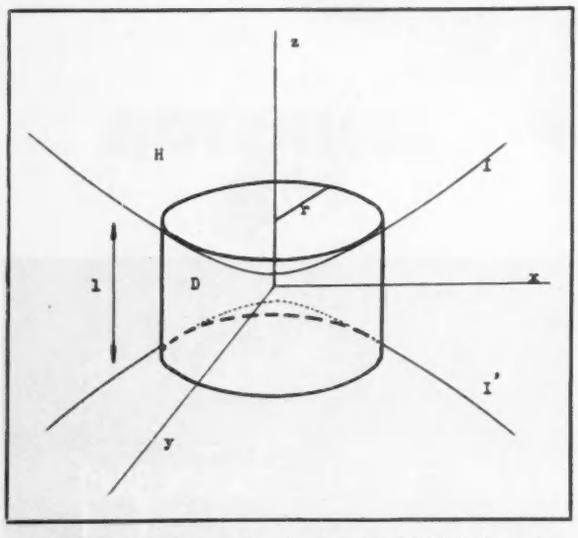


FIGURE 5. Calculation of resistance for shielded-electrode.

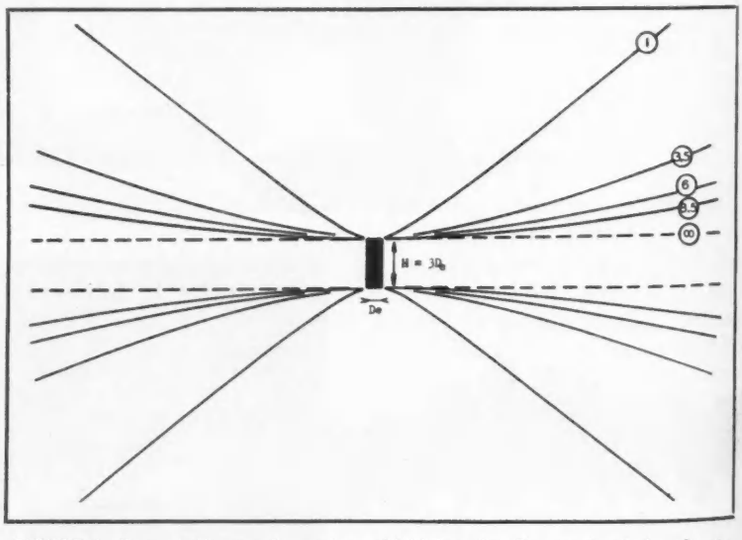
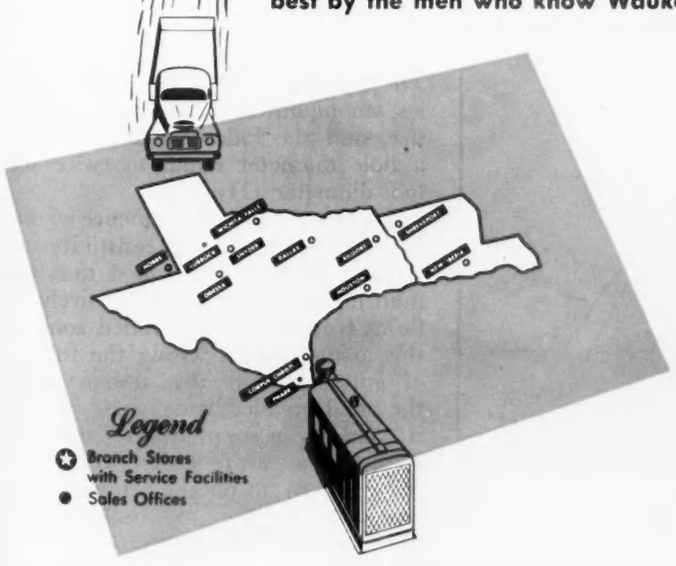


FIGURE 6. Current Nappes for various shield lengths. Figures in circles denote the ratio: Shield length/electrode diameter.

AT HOME

YOUR *Waukesha* ENGINE IS TREATED BEST AT HOME, TOO

So for service on your Waukesha Engine call Waukesha Sales and Service. You'll be sure then of getting the latest in factory-service techniques and the best in Waukesha factory-trained mechanics. Waukesha service is at your call twenty-four hours a day to help when you need it most. And to make Waukesha service fast and dependable, there are ten complete service shops strategically located in Texas, eastern New Mexico, and Louisiana. You will be treated best by the men who know Waukesha best.



WAUKESHA

SALES & SERVICE, INC.

1422 MAURY STREET • HOUSTON, TEXAS

EXCLUSIVE DISTRIBUTORS FOR WAUKESHA PRODUCTS IN TEXAS, LOUISIANA AND EASTERN NEW MEXICO

shields are infinitely long.

Apparent Resistivity

Relation 4 expresses resistance R as a function of the formation resistivity and of the measuring device dimensions. A resistance measurement R made in a uniform formation permits computing the formation resistivity from the following relation:

$$R_f = \frac{R}{f(\infty, D_e/2)}$$

If the medium in which the measuring device is placed is not uniform, for example if the mud resistivity is different from the formation resistivity, the preceding formula does not give the true formation resistivity, but the apparent resistivity. Therefore the apparent resistivity R_a obtained by a shielded-electrode is given by the following formula:

$$R_a = \frac{R}{f(\infty, D_e/2)} \qquad (5)$$

In the case where the dimensions of the logging device are $H = 3D_e$, $L = 18D_e$ and $D_e = 4$ inches, R_a equals 0.53R, R being the measured resistance.

Penetration

The relative effect of each part of the ground on a measurement made by the shielded-electrode can be calculated simply from Equation 3 or 4. For the tool whose dimensions are $H = 3D_e$, $L = 18D_e$, $Sh = 7.5D_e$ the result is shown by the solid line of Figure 7. It can be seen that the effect of the ground at a distance from the bore axis equal to four times the tool diameter is about ten times less than the effect of the ground touching the electrode.

The same data are given also on Figure 7 (interrupted line) for an electrode having very short shields ($Sh = D_e$). It is seen that, for this electrode, the effect of the ground near the tool is 50 percent greater than for the electrode having the longer shield.

The integrated effect of the ground measured from the electrode to any distance from the bore axis is represented on Figure 8. The curves are so calibrated that the total resistance to infinity is indicated as 100 percent of the signal. This figure shows that with the longer shields ($Sh = 7.5D_e$) the formation up to a distance equal to twice the tool radius contributes about 20 percent of the measurement, while up to a distance equal to twenty times the tool diameter it contributes 90 percent of the measurement. If the shield length is reduced from $7.5D_e$ to D_e, all other dimensions remaining the same, the formation up to a distance equal to ten times the tool diameter contributes about 90 percent of the signal. Hence it can be said that the former tool has about twice the penetration of the latter tool.

Effect of Mud

Assume now that the shielded-electrode is run in a hole of diameter D containing mud of resistivity R_m, and that the formation is thick and is invaded by the mud up to a diameter D_i. Let R_i be the resistivity of the mud invaded zone and R_f the formation resistivity. The apparent resistivity can be expressed as the sum of three terms corresponding to the mud, to the mud invaded zone and to the non-invaded formations, as follows:

$$R_a = \frac{1}{f(\infty, D_e/2)} \times \left[\begin{matrix} R_m f(D/2,\ D_e/2) + R_i f(D_i/2,\ D/2) \\ + R_f f(\infty, D_i/2) \end{matrix} \right] \qquad (6)$$

It is obvious from the preceding discussion that the numerical value of function f is given by the chart of Figure 8.

Non-Invaded Formations

If there is no mud invasion:

$$R_a = \frac{1}{f(\infty, D_e/2)} \left[R_m f(D/2,\ D_e/2) + R_f f(\infty, D/2) \right] \qquad (7)$$

For the tool whose characteristic is shown as curve A on Figure 8, the resistivity departutre R_a/R_f is represented graphically on Figure 9 as a function of R_f/R_m, and for several hole diameters. This figure shows that the departure is small when, simultaneously, the formation resistivity is greater than the mud resistivity and the hole diameter is not much greater than the tool diameter. If the formation resistivity is less than about one-third the mud resistivity, the departure is generally large, even for small hole sizes.

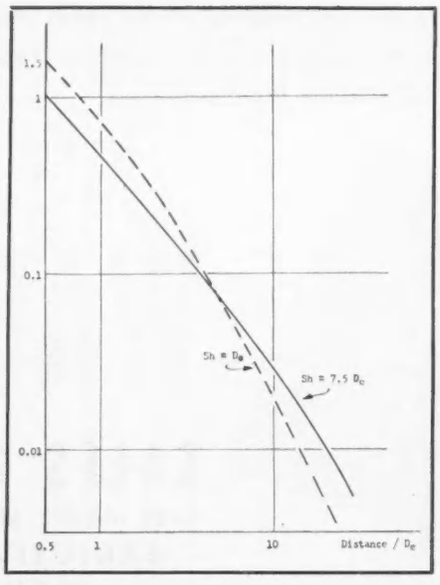


FIGURE 7. Relative effect of each part of ground as a function of distance from bore axis.

It should be noted that the first term of formula 7 is constant so long as the hole diameter is uniform. If it is not uniform it can be easily computed from Figure 8 when D and R_m are known.

The effect of the mud can therefore be summarized as follows. It will be assumed that the mud resistivity is known with fair accuracy (for example ±20 percent).

1. If the size of the hole is known, the data can be corrected and the formation resistivity can be obtained accurately.
2. If the size of the hole is not known but the formation resistivity is greater than one-half the mud resistivity, the apparent resistivity is nearly equal to the true resistivity unless there is considerable caving.
3. If the size of the hole is unknown and the formation resistivity is less than one-half the mud resistivity, the shielded-electrode may give extremely unreliable data.

Effect of Mud Invasion

Characteristic curves such as those of Figure 8 can be readily established from Equation 4 for any shielded-electrode dimensions. From these curves the effect of mud invasion can be investigated by using Equation 6. For the sake of simplification it will be again assumed that the tool dimensions are those which were selected before (tool A shown on Figure 8). Equation 6 can be written:

$$\frac{R_a}{R_f} = K_m \frac{R_m}{R_f} + K_i \frac{R_i}{R_f} + K_f \qquad (8)$$

The K's can be computed from Figure 8, or equivalent, and their sum equals unity:

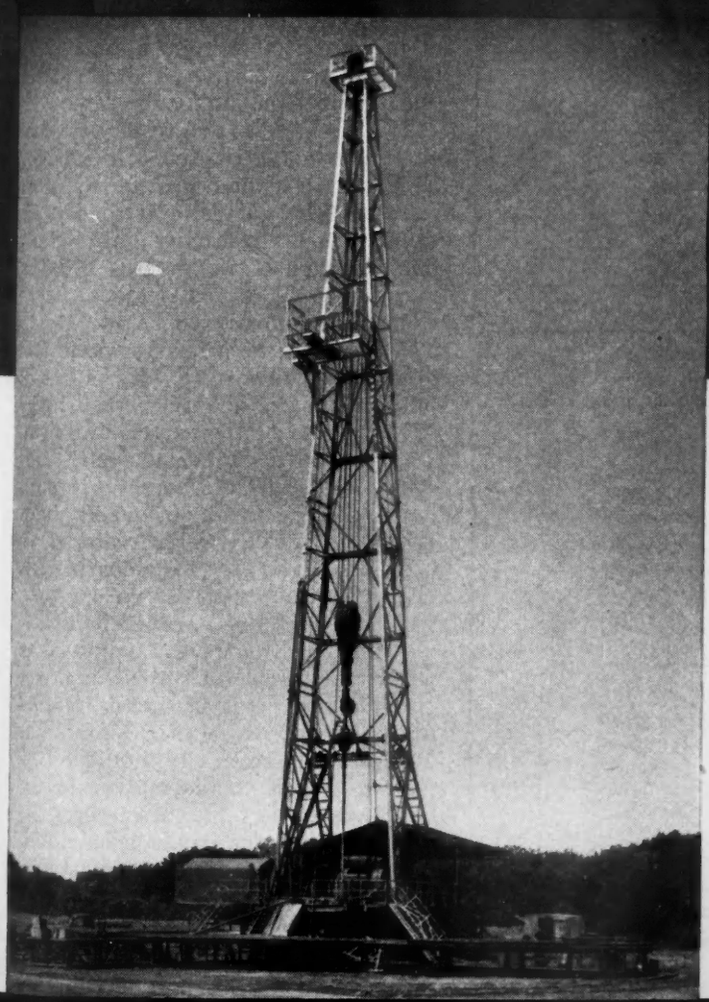
$$K_m + K_i + F_f = 1$$

The resistivity departure R_a/R_f varies, among other factors, with the hole size, and the following data are for a hole diameter equal to twice the tool diameter ($D = 2D_e$).

To investigate the influence of the various factors on the resistivity departure it will be assumed that the mud filtrate has displaced entirely all fluids from the mud-invaded zone. If this assumption is wrong the follow- of invasion and the resistivity of the mud-invaded zone were known, it would be a simple matter to make a rather accurate correction (from Equation 8) to obtain a fairly accurate value of the true resistivity. In practice, the data necessary to make

LEE C. Moore

depend on LEE C. Moore engineering for *standard* and *specialized* drilling structures

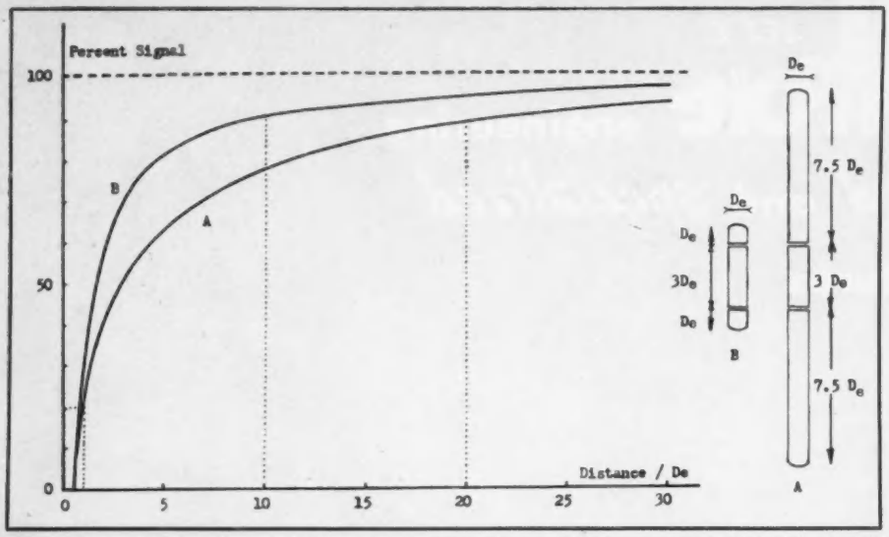


Chances are there is a standard Lee C. Moore Mast or Derrick to meet your drilling requirements. However, when specially designed structures are required consult a Lee C. Moore representative for fast, progressive engineering service.

LEE C. MOORE CORPORATION

TULSA • DALLAS • HOUSTON • MIDLAND • SHREVEPORT • WICHITA • CENTRALIA • PITTSBURGH

Export Office — 9 Rockefeller Plaza, New York 20, N. Y.



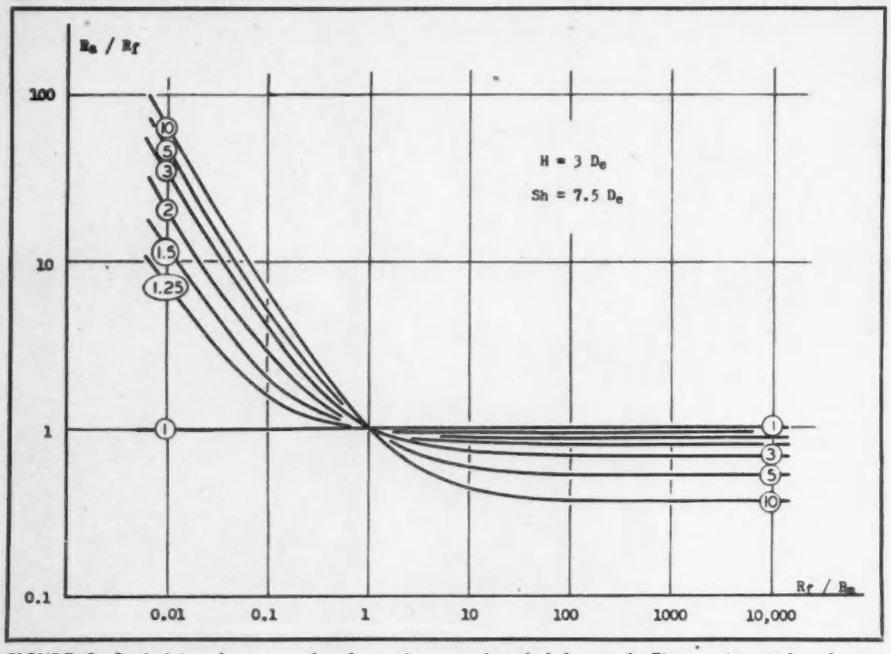


FIGURE 9. Resistivity departure for formation not invaded by mud. Figures in circles denote Ratio D/De.

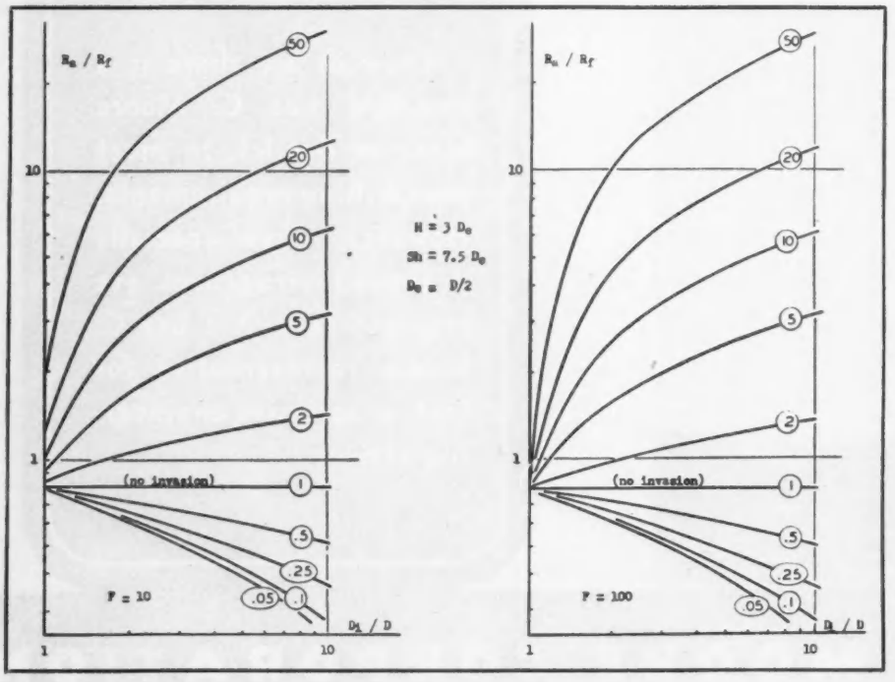


FIGURE 10. Resistivity departure for mud-invaded formation. Figures in circles denote Ratio R_i/R_f.

FIGURE 8. Characteristics of shielded-electrode showing integrated effect of ground as a function of distance from bore axis.

ing data can be easily modified to fit actual conditions.

If F denotes the formation factor, then $R_i = FR_m$. Substituting in Equation 8 gives:

$$\frac{R_a}{R_f} = \left(\frac{K_m}{F} + K_i\right)\frac{R_i}{R_f} + K_f$$

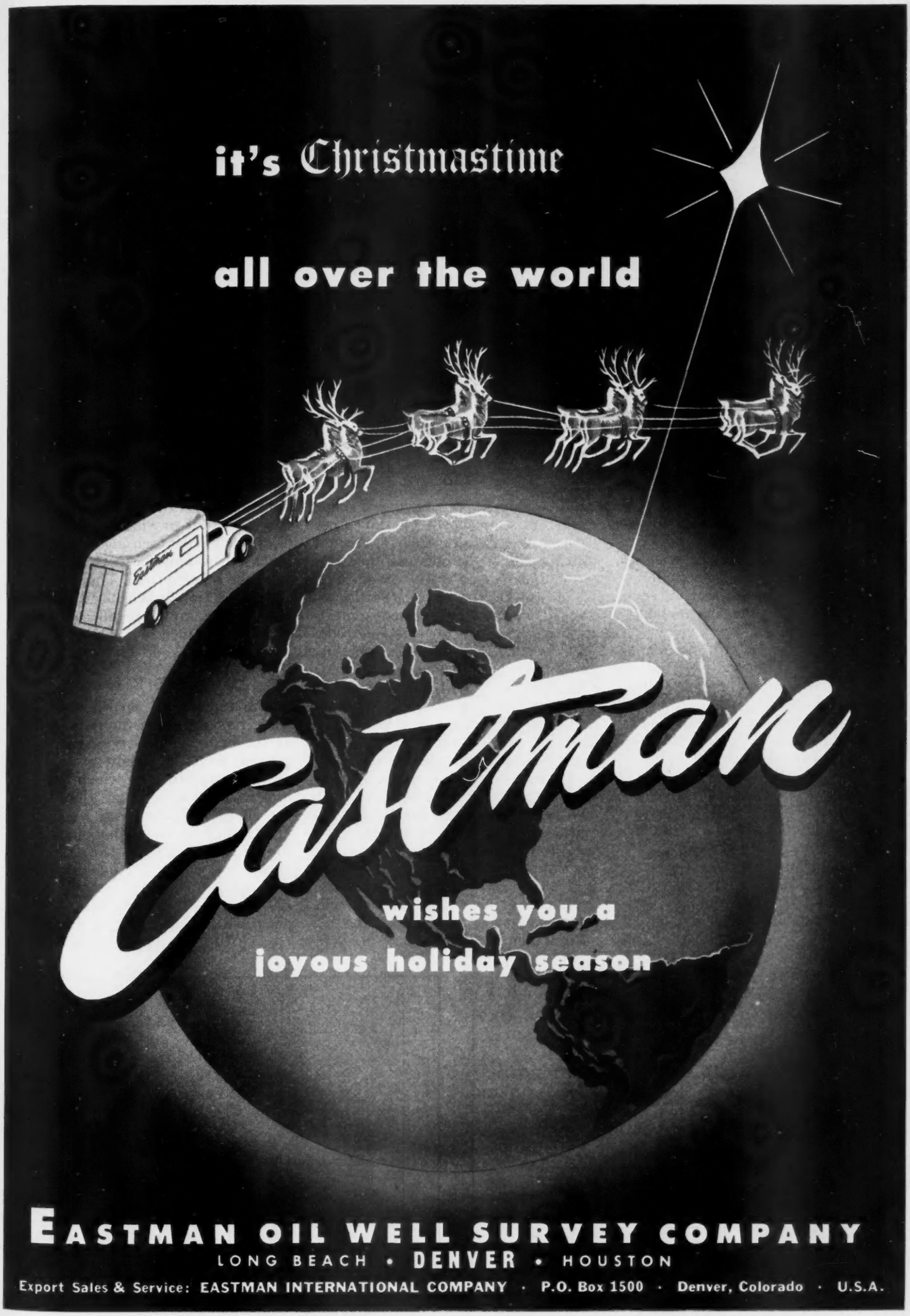
This relation is represented graphically on Figure 10 as a function of the diameter of invasion and for several values of the term R_i/R_f. The charts are for a formation factor equal to 10 and 100, respectively. Figure 11 represents the same data, but plotted as a function of R_i/R_f. These figures show that the response of the shielded-electrode in a mud-invaded formation is as follows:

1. If we except the case where there is very little mud invasion (and for which the response is pratically the same as that of the no-invasion case), it can be seen that the influence of the formation factor on the apparent resistivity is almost negligible. Hence it can be said that, in mud-invaded formations, the response of the shielded-electrode is pratically independent of the pore geometry, all other factors remaining the same.

2. As a whole the resistivity departure, whether positive or negative, increases when the degree of invasion increases: the shielded-electrode does not give good resistivity data when the diameter of invasion is greater than about 2D, except in some accidental cases mentioned below.

3. The best response is when the numerical value of R_i/R_f is comprised between about 1 and 2, regardless of the degree of invasion. This result was to be expected because, electrically, this condition is similar to the case of a non-invaded bed. When the ratio R_i/R_f is greater than 5 or less than 0.25, the departure is usually large, especially in low resistivity beds (R_f less than R_i).

4. The foregoing shows that, as a whole, the shielded-electrode is not a good logging tool for mud-invaded formations. However if the mud has a much lower resistivity than the formation and if the formation factor has a relatively high value, then the ratio R_i/R_f is small and the shielded-electrode usually gives a satisfactory log. Otherwise the apparent resistivity is much greater than the true resistivity. Nevertheless, if the amount


it's Christmastime
all over the world
Eastman
wishes you a
joyous holiday season
EASTMAN OIL WELL SURVEY COMPANY
LONG BEACH • DENVER • HOUSTON
Export Sales & Service: EASTMAN INTERNATIONAL COMPANY · P.O. Box 1500 · Denver, Colorado · U.S.A.

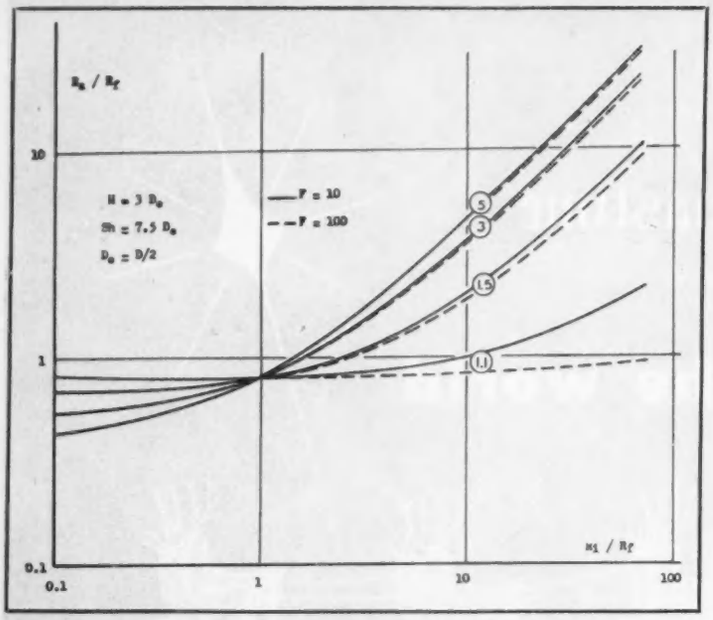


FIGURE 11. Resistivity departure for mud-invaded formation. Figures in circles denote Ratio D_1/D.

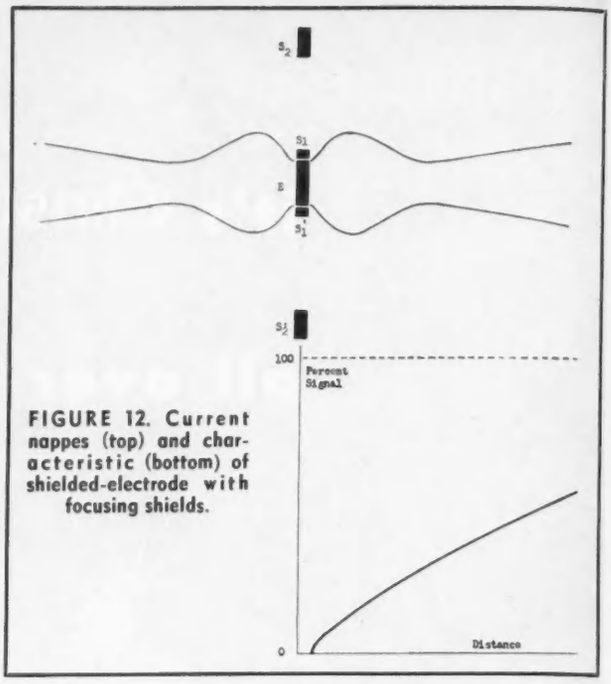


FIGURE 12. Current nappes (top) and characteristic (bottom) of shielded-electrode with focusing shields.

this correction can be generally obtained only from conventional multiple electrode resistivity graphs, and when these data are available the true resistivity is also generally available from the same source and there is then no need for the shielded-electrode.

5. Most of the charts presented above are for a shielded-electrode of given dimensions. Nevertheless they apply qualitatively very well to almost any dimensions. Accurate quantitative data can be obtained easily from the formulas discussed above.

Arrangement with Focusing Shields

The influence of the mud and of the mud-invaded zone can be decreased if a system can be developed for which the characteristic is more or less as shown on the lower part of Figure 12. It will be apparent from Ohm's law that this can be achieved if the current leaving electrode E remains within nappes having a shape similar to that shown on the upper part of the Figure. Such a current distribution can be obtained by using, for example, two pairs of shields,[2] as shown by the figure. Shields S, and S′, are short and placed immediately above and below the electrode, respectively: They produce the inflated zone near the electrode. Two other shields S_2 and S'_2 having an appropriate potential constrict the current sheet at a distance of perhaps 5 times the bore radius, i.e., at a distance beyond which there is generally no appreciable mud-invasion. The response of a logging system of that nature is summarized on Figures 13 and 14, which show some improvement over the non-focused system; nevertheless, the basic limitations of the method are still apparent.

It can be seen that the current sheet of the arrangement having focusing shields is thicker near the bore hole than that of the two-shield system discussed previously. Hence, the electrode having focusing shields picks formation boundaries less sharply than the other system. This, however, is not a major drawback because the desired amount of detail can generally be obtained by shortening the length of Electrode E.

Thin Beds

The response of the shielded-electrode remains about the same so long as the bed thickness is several times greater than the height of the center electrode. In beds which are only somewhat thicker than this height the shape of the current sheet is a little different from that shown on Figure 6; nevertheless, the charts discussed previously apply reasonably well, qualitatively at least. When individual beds are thinner than the electrode height, the shielded-electrode gives a weighted average resis-

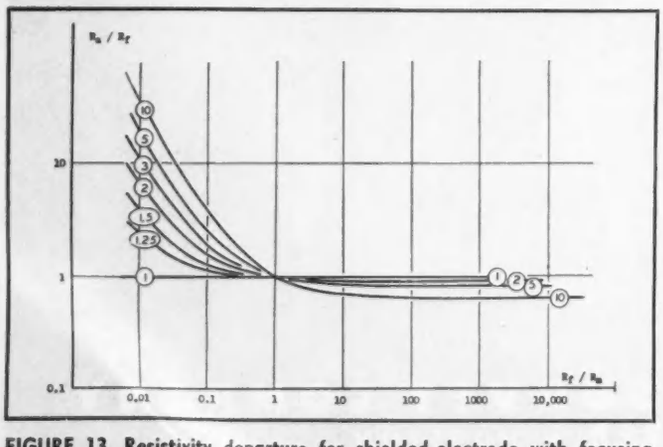


FIGURE 13. Resistivity departure for shielded-electrode with focusing shields. Data are for non-invaded formations. Figures in circles denote Ratio D/D_o.

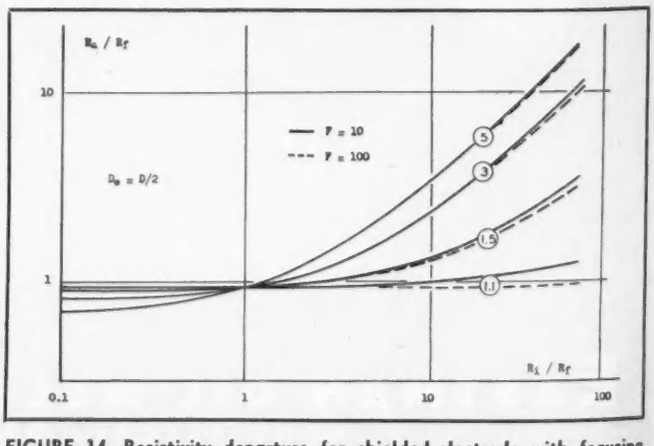
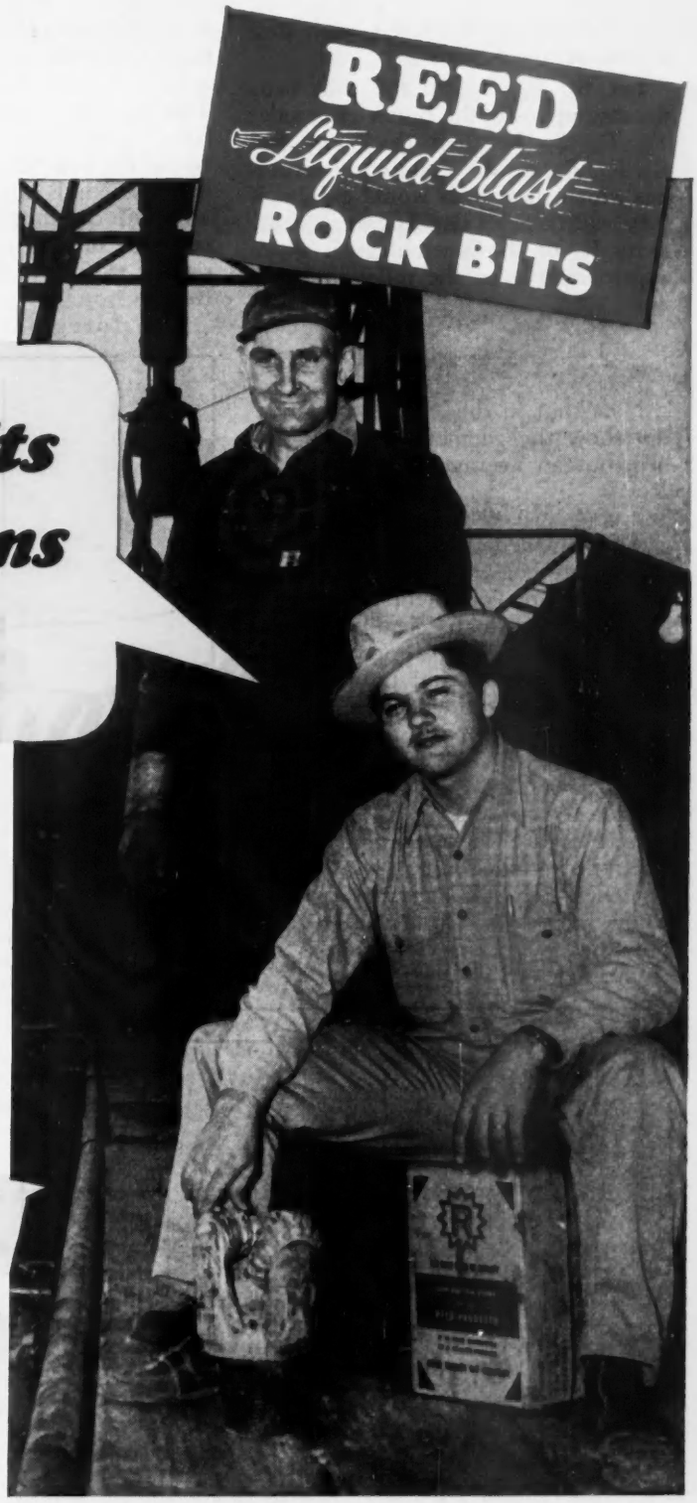


FIGURE 14. Resistivity departure for shielded-electrode with focusing shields. Data are for mud-invaded formations. Figures in circles denote Ratio D_1/D.

George Ballow, tool pusher in Kansas for Nye Drilling Company, says . . .

REED *Rock Bits give good long runs in Kansas*

Mr. Ballow added, "We run into all kinds of formations here in Kansas, but I have found there is a **REED** Rock Bit that does a good job in every formation we encounter."



Bill Tobias, driller (standing) and George Ballow, tool pusher (seated) are shown with a **REED** TST-1 Rock Bit. This bit is noted for fast drilling of the softer Kansas formations.

REED ROLLER BIT COMPANY

HOUSTON 1, TEXAS

NEW YORK LONDON BUENOS AIRES

2719

tivity which can be closely estimated as follows:

Let B_1, B_2, B_3, be the thin beds situated opposite the center electrode; T_1, T_2, T_3, be their thickness, and R_1, R_2, R_3, be the apparent resistivities which these beds would exhibit if they were thick. The apparent resistivity R_a of the assemblage is given approximately by the following relation:

$$R_a = \frac{H}{T_1/R_1 + T_2/R_2 + T_3/R_3}$$

Note that in this case the log does not show the geometry of each thin bed, but an average silhouette.

Modified System

The shielded-electrode introduces. in the bore hole, bodies which are not only excellent conductors, but which are also electro-chemically active; these bodies modify appreciably the natural potentials and prevent their accurate measurement. This shortcoming is minimized by using the arrangement[3] shown on Figure 15 which uses only small size metallic bodies. Its principle is as follows: E, S, and S′ are the equivalent of the electrode and shields mentioned above. but their height is considerably less; a few inches. P_1, P'_1, P_2 and P'_2 are potential measuring electrodes. S is connected to S′; P_1 to P_1' and P_2 to P'_2. The voltage on SS′ is so controlled that the four P electrodes have approximately the same potential. This compels the current flowing from E to remain substantially between the two horizontal planes passing through P and P′, at least up to a certain distance from the hole. The response of this system seems to be similar to that of the two-shield electrodes.

The foregoing discussion shows that, unless very thin beds are considered, the apparent resistivity obtained for a bed is practically independent of the resistivity of the surrounding formation. This results in the two following advantages which the conventional multiple-electrode arrangements do not have: first the log picks each boundary sharply and accurately, second the calculations are relatively simple.

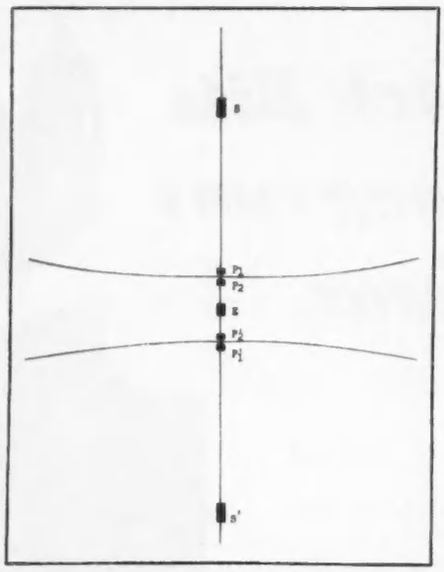


FIGURE 15. System using an array of small electrodes instead of long shields (after Doll, 1951).

Conclusion

The shielded-electrode is a good tool for delineating the geometry of individual beds, even relatively thin.

In non-invaded formations: it permits obtaining true resistivities accurately when the hole size is known. If the hole size is unkown, it gives fairly good resistivity data in high resistivity formations, but poor data in low resistivity formations.

In mud-invaded formations: the resistivity data are usually poor if there is appreciable invasion, especially in low resistivity beds.

Some ideal logs obtained with shielded-electrode A of Figure 8 are shown on Figures 16 and 17.

REFERENCES

[1] G. V. Keller, "An Improved Electrode System for use in Electric Logging," *Producers Monthly*, August, 1949.

[2] G. V. Keller, "Modified Mono-Electrodes for Improved Resistivity Logging," *Producers Monthly*, July 1950.

[3] H. G. Doll, "The Laterolog: A new Resistivity Logging Method with Electrodes using an Automatic Focusing System," AIME Meeting, St. Louis, February, 1951.

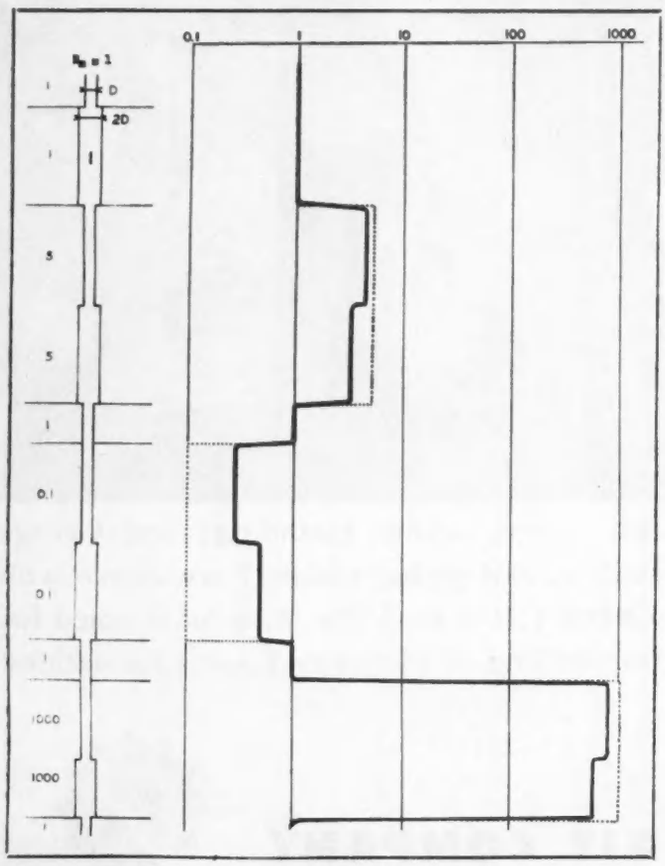


FIGURE 16. Typical log for non-invaded formation. Figures at left denote formation resistivity. Dotted lines show true formation resistivity.

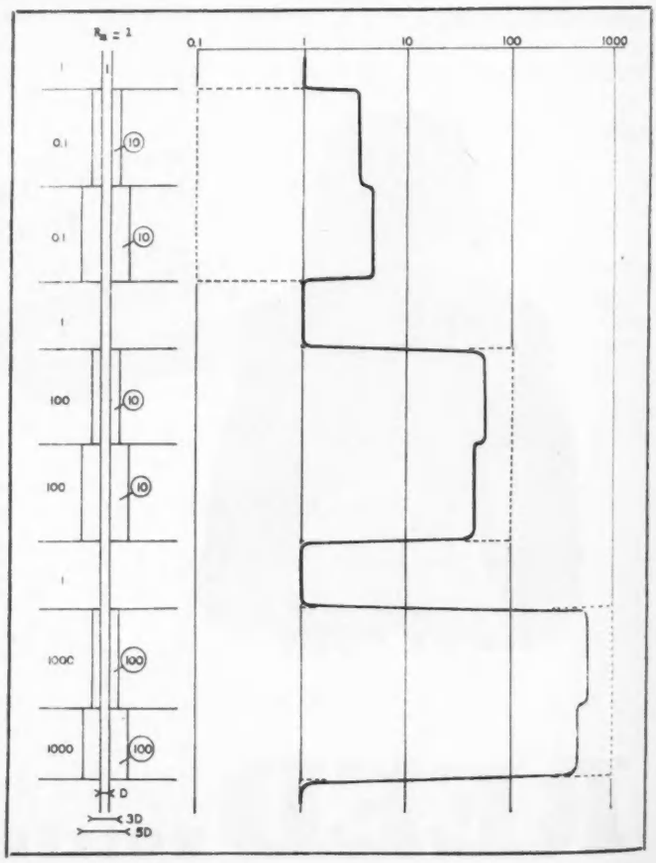
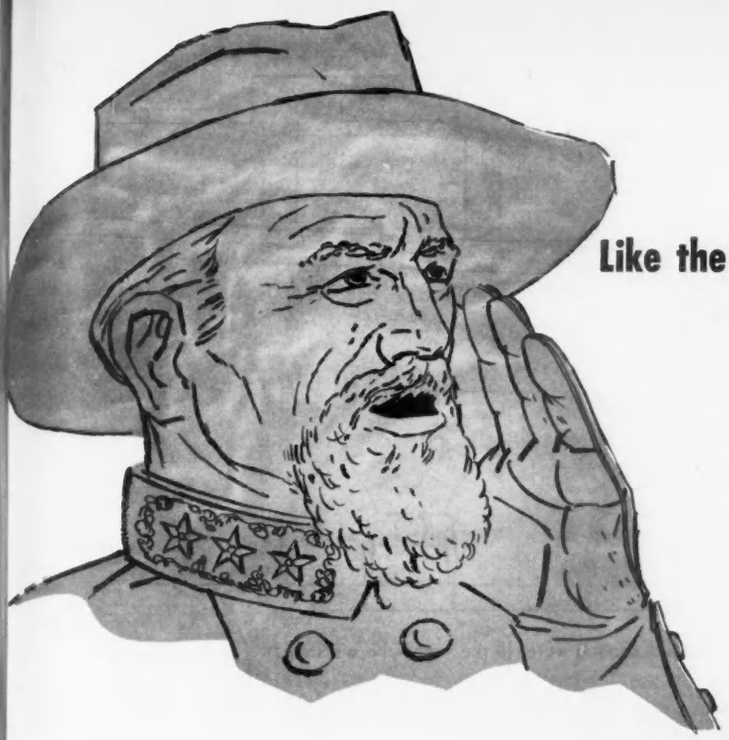


FIGURE 17. Typical log for mud-invaded formation. Figures at left denote formation resistivity. Figures in circles are resistivity of mud-invaded zone. Dotted lines show true formation resistivity.



Like the Motto of General Nathan Bedford Forrest

MAGCOBAR DEALERS

"GIT THERE FUSTEST WITH THE MOSTEST"

Your Magcobar Dealer keeps ample stocks on hand at all times and maintains a fleet of delivery trucks to give you 'round the clock service. Their motto . . . like that of General Nathan Bedford Forrest . . . is to "git there fustest with the mostest."

Many times this fast Magcobar delivery service has prevented blowouts which would have resulted in loss of life, caused serious property damage and a waste of vital natural resources. When you need mud, be sure to call your Magcobar Dealer. There are more than 300 Magcobar Dealers strategically located to give fast service throughout the oil country.

Magcobar
Complete
DRILLING MUD SERVICE
DEALER

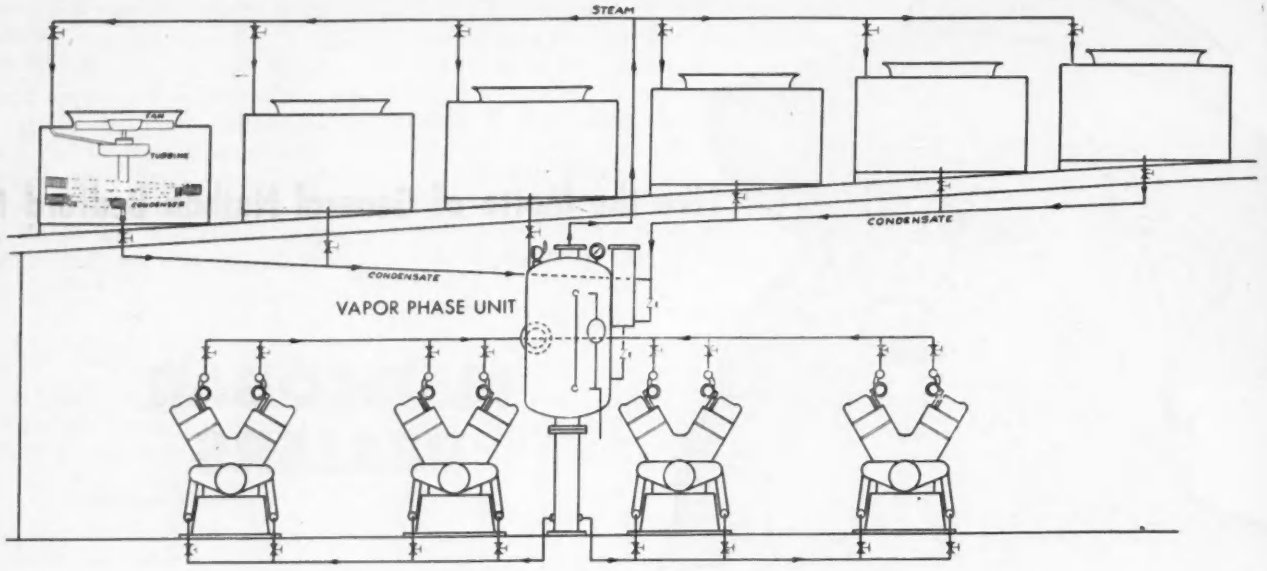
- MAGCOBAR
- MAGCOGEL
- HIGH YIELD
- MAGCO-FIBER
- XACT CLAY
- FIBER SEAL
- SALT GEL
- MAGCO-PHOS
- RED OX
- MAGCO-MICA
- TANNATHIN
- JEL-OIL MUD
- JEL-OIL "E"
- "E" CONCENTRATE
- NOHEEVE
- SEAL FLAKES
- MY-LO-JEL PRESERVATIVE
- QUEBRACHO
- CHEMICALS

Write today for your free copy of the booklet, "Magcobar Service . . . in tune with industry needs."

MAGNET COVE BARIUM CORPORATION

ONE OF THE DRESSER INDUSTRIES

MALVERN, ARKANSAS • HOUSTON, TEXAS



Sketch illustrates the path followed by the engine cooling water in the vapor phase system.

Drilling Engines Cooled With Own

WASTE HEAT

By FRED M. BURT

A NEW and unusual system for drilling engine cooling is being used on a Signal Oil and Gas Company drilling rig on the Bolsa Lease in Huntington Beach field of California. The system utilizes vapor phase cooling, a method that has been in use for some time in stationary power plant installations in other industries. Only recently applied to drilling engine service, the system has a number of operating advantages. In place of the large conventional radiator-fan units, cooling now is done by one central vapor phase, waste heat recovery unit together with six steam turbine fan condensers. Elimination of the conventional radiators makes available, under full load conditions, about 90 horsepower more output and without additional fuel consumption.

The drilling rig has a capacity of 12,000 feet using 4½-inch drill pipe and is powered with four 12-cylinder, 300-horsepower natural gas engines. Engines 1 and 2 power the drawworks and rotary table, while Engine 4, sometimes in conjunction with 3, powers the mud pumps. In addition, all four engines can be operated as a single unit to power the drawworks.

DESCRIBED HEREIN is the substitution of a vapor phase cooling plant for conventional engine radiators. Employed on four 12-cylinder natural gas engines, it has been found that cooler circulating fluid is assured and the plant output is increased 90 horsepower without consumption of additional fuel.

Hot water taken from the top of each of the engine's cooling system flows into a 38-inch diameter by 68-inch high vapor phase tank where it is converted to steam at pressures up to ten pounds per square inch. This steam is conducted to six condensers, which are suported by a structure above the engines. The steam drives a 36-inch fan in each of the condensers. Cool air is pulled up through the condensers and exhausted to atmosphere above the engine house structure; the steam is condensed and the condensate then returns to the engines to be used again as cooling water. The cycle is repeated without water loss unless there is leakage in the system. The greater the volume of steam generated, the faster the turbines are turned, thus increasing the flow of air through the condensers and increasing the cooling capacity of the system. Design of the turbines makes it possible for them to operate under very low pressures.

The value of the vapor phase type of cooling system is more apparent when one realizes the type of service drilling engines normally have. The engines generally run continuously during the drilling of a well, maximum power being used during hoisting operations. At other times, one or two engines may be loaded to capacity while others are idle. During hoisting operations, particularly, the engines operate alternately at full throttle then at idle, as stands are broken out of the drill string. Engines which are idled suddenly after a period of full load operation often boil over and the radiator fan slows to a speed at which very little air is drawn through the radiator. In addition, the conventional vertical radiators often lose cool-

exploring new frontiers

. . . portable rig equipped with Torrington Bearings

Remote locations are easier to reach with the "2500" Portable Drill manufactured by Geo. E. Failing Supply Co. Mounted on a truck bed or trailer, this self-contained unit can be taken almost anywhere. Once set up, it can drill to a depth of 4,000 feet.

Torrington Spherical Roller Bearings in the crown block and traveling block assure ample capacity to handle this rugged work, including 30,000 pound drill string loads. These self-aligning bearings provide smooth, dependable operation even when shafts are deflected by shock loads. Binding stresses are eliminated, bearing life lengthened, and maintenance requirements reduced.

This combination of high load capacity, automatic self-alignment and easy maintenance has solved many a friction problem for manufacturers of heavy-duty equipment. Torrington Spherical Roller Bearings can do the same for you.

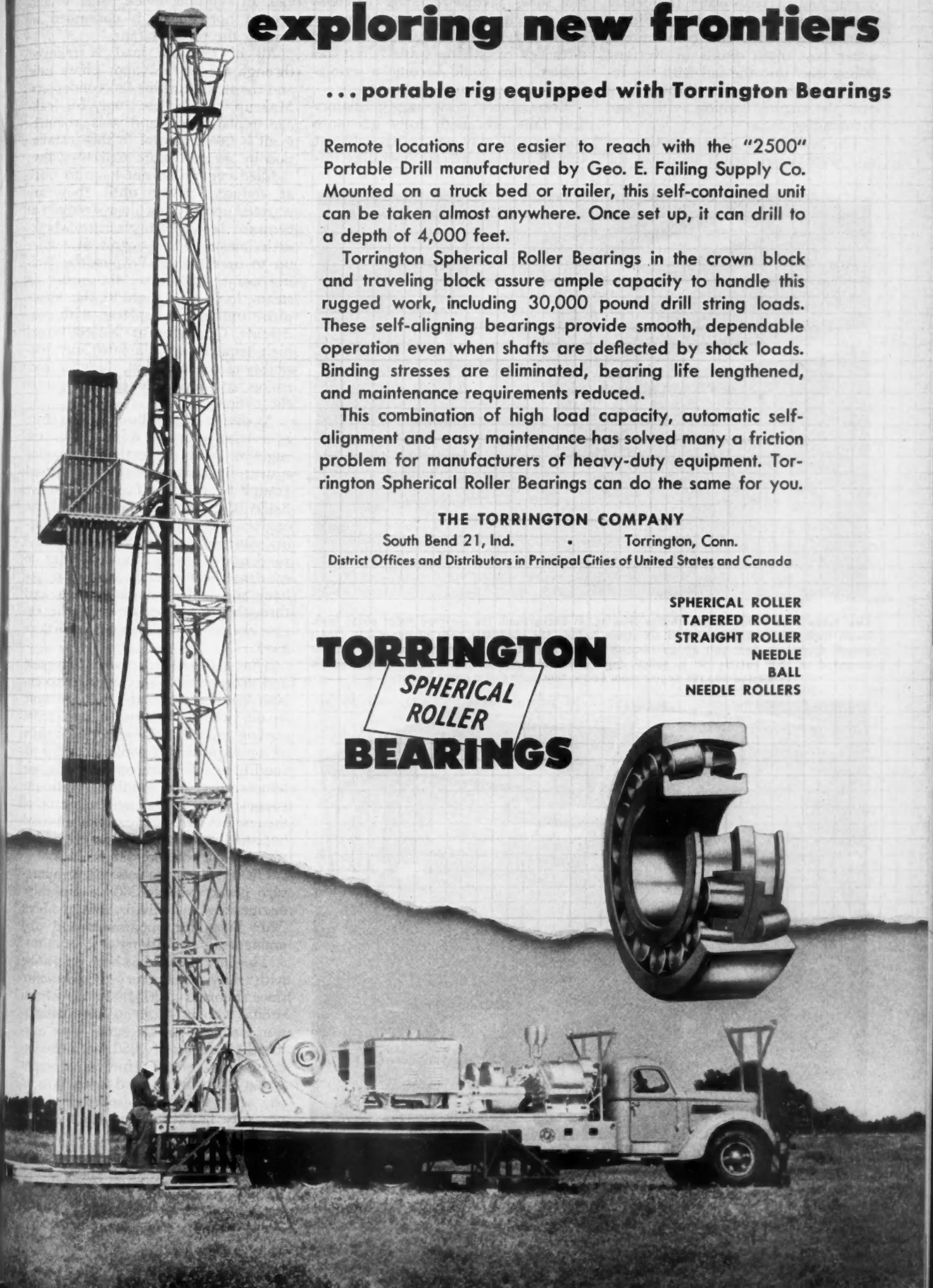
THE TORRINGTON COMPANY

South Bend 21, Ind. • Torrington, Conn.

District Offices and Distributors in Principal Cities of United States and Canada

TORRINGTON
SPHERICAL ROLLER
BEARINGS

SPHERICAL ROLLER
TAPERED ROLLER
STRAIGHT ROLLER
NEEDLE
BALL
NEEDLE ROLLERS



of air moving through the radiator, usually results in under-cooling of the engine and makeup water frequently must be added to the radiator. Filling the radiator with the conventional water hose often results in overflow falling over into the fan with the result being that water is thrown back over the engine, ignition system and surrounding area.

The addition of large quantities of raw water often tends to cause the accumulation of lime and scale deposits in the engine jacket and radiator tubes, further reducing the cooling capacity of the units. In areas where water must be transported long distances or where water must be treated, this could become a serious factor in operating costs.

Even where very large radiators and fans are used, fully adequate cooling still may not be available at times when engines are operating under severe conditions or when excessively high air temperatures prevail. In addition, much valuable and needed horsepower is consumed in driving the radiator fans.

All of the fan load is relieved through use of the vapor phase unit and the steam turbine fan condensers. Makeup water is used only for leakage replacement and this requirement is taken care of in this installation by an automatic makeup valve.

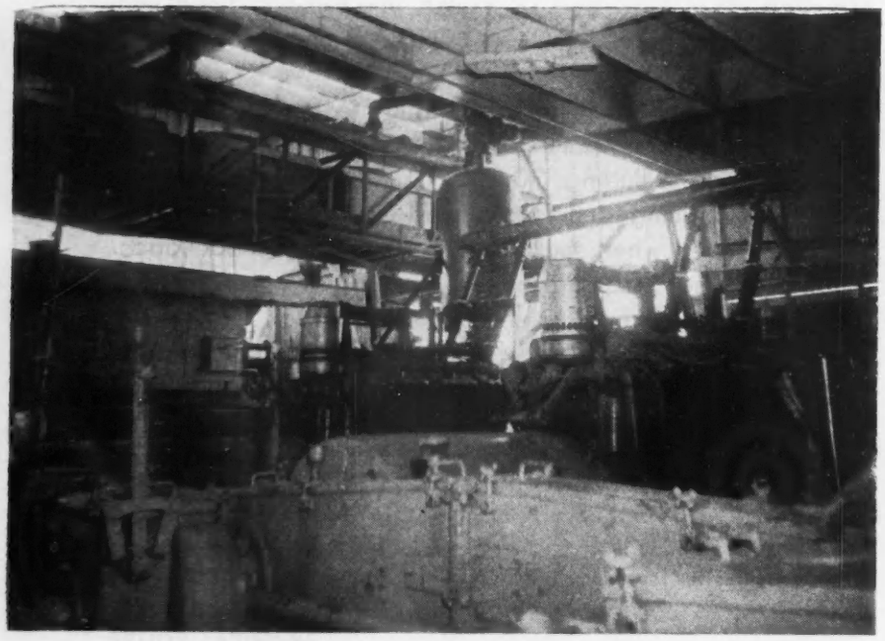
Idled engines do not have to work at reduced power until they are warmed up, for they always remain at constant boiling temperature whether idling or in any degree of service up to overloading. Beyond the boiling point, of course, the water in steam form passes on to the vapor phase unit and is replaced with condensate. Operation at this continued high temperature elimiates any possibility of condensation, sludging, corrosion and any appreciable wear in the cylinders.

As shown in the illustrations, there is a relatively low ceiling over the engines. With the orthodox cooling system, the heat generated and spread around by radiator fans would have made it unbearably hot around the engines and adjacent equipment during summer months. With each of the condensers having the capacity to condense 600 pounds of steam per hour and with insulated piping used throughout, temperatures in the engine shelter are held at a comfortable level.

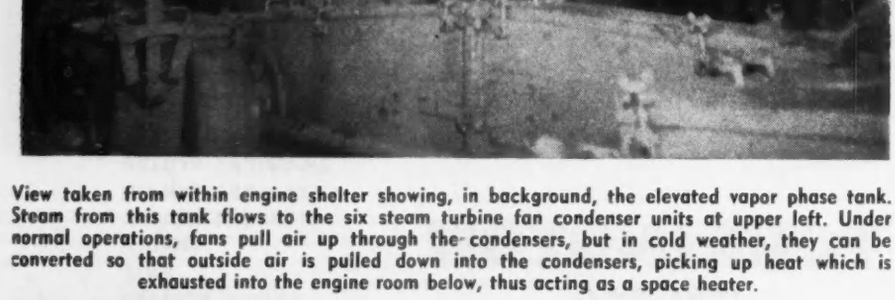
The turbine fan speeds increase and decrease in direct relation to engine loads; more load produces more steam, which, in turn means more cooling capacity. The exact quantities of air required for cooling, under all conditions of load or ambient air temperature, are supplied. With the vapor phase central system, some of the engines may be greatly overloaded but still be adequately cooled within the capacity of the system.

On hot days the lube oil temperature never exceeds 230° F. in these engines and, usually, is held at about 220° F. under maximum load and ambient air conditions.

This installation has been operating with fully satisfactory performance since February, 1951. Previously, a similar vapor phase cooling installation was used on the same lease during the summer of 1950, with the exception that smaller, individual vapor phase units were used with two of the same type and size engines. No necessity has developed for oil cooling, the oil remaining at about the same temperatures in both the individual and the central vapor phase systems.



View taken from within engine shelter showing, in background, the elevated vapor phase tank. Steam from this tank flows to the six steam turbine fan condenser units at upper left. Under normal operations, fans pull air up through the condensers, but in cold weather, they can be converted so that outside air is pulled down into the condensers, picking up heat which is exhausted into the engine room below, thus acting as a space heater.



This close-up view shows the vapor phase tank which converts waste heat from the engine cooling system into low pressure steam. In background can be seen three of the turbine fan condenser units.

Strata Variants Create Reactions In Plugged Wells

By F. R. COZZENS

Equity Oil & Gas Company, Stockport, Ohio

THE TECHNIQUE of abandoning a dry hole is an exacting process demanding finely regulated control. The author describes time-tested methods with an accompanying discussion of the disastrous results of haphazard methods. It is not unusual to abandon a well and in later years offset the same location. If proper caution has not been taken in the plugging operation the seepage of fluids and gases into thief formations will establish abnormal pressures at unsuspected depths. All strata within the well bore become communicative due to shrunk or improperly placed plugs and each section will become vulnerable to migrating gases and fluids.

SINCE most exploratory wells are non-productive, it can be assumed that an area of strata devoid of oil is devoid also of physical interference with areas containing oil, particularly when bore-plugging measures have been carried out.

A great many producers, contractors, and rig crewmen share this contention despite the fact that followup drilling in spotted or wildcatted districts reveal formation disturbances identically the same as those encountered in settled fields, following the era of pioneer development when abandonments were plugged carelessly, or not plugged at all. Especially significant is the prominence of such disturbances in the immediate vicinity of "dusters"; among the more common and troublesome factors being the presence of oil and gas pockets at unsuspected depths; surface water in lower stretches of hole; excessive caving; spongy walls; and localized bore-restrictions which add to drilling difficulties, and retard the completion of wells. Why plugged dusters should become re-active, and prove more potent than plugged producers is not clearly defined in field practice until after a sufficient number of wells have been drilled in a given district so that correlation tests can be made on the strata involved. It then becomes obvious that rock potentials vary considerably between productive and non-productive areas, and that physical characteristics at the point of penetration play a very important role in retaining or releasing plugs. From a geologic basis, the great majority of so-called dusters occur in disharmonized strata, within or near faults, or where layers of pay sand are lensing in or lensing out. These localized areas are disrupted from parent rock, and are therefore in conjunction with it through crevices and channels created by such disruption. Wherever petroliferous rock is disharmonized physically, its structural composition is unbalanced. Some constituents are deficient in quantity, or missing entirely, and generally, most deficiencies are replaced with clay, argillite, or silty composites which may constitute the binder between sand particles, or appear as veins or beds of shales, interlacing the structure or separating its normal components.

Disrupted or disharmonized spots will occur at any abnormal point in a structure, from dome to base. They may terminate within a few feet from the point of drill-penetration, or may extend over an area of many acres, and are rarely productive of either oil or gas. Therefore in abandonment procedures on an annulus in such make-up, clay and its affiliates become especially treacherous because, without corrective measures, no plug can be seated effectively in a dilatant or resilient sand-shoulder. Clayey, or spongy composites which are invariably flocculated by water during the drilling-in process begin to shrink and contract immediately after a plug is set, and annulus drainage closed off. Physical resistance around the plug lessens gradually as the walls dry out. Further shrinkage occurs within the sand bore below the plug. Water used in mixing the filling material or running the material into the sand bore, recedes into the spongy horizons along the walls, leaving a space of bore cavity between plug and filler which become a receptacle for migrating fluids and gases. Eventually, inner pressures accumulate sufficiently to channel through the weakened structure around the plug, and the abandonment becomes a leaker, receiving drainage from the annulus, and elevating bore residue into upper strata. Exploratory leakers are particularly damaging because years may elapse before further drillings are made in the locality; and during that interval thief formations at various depths along the supposedly plugged annulus will absorb and become heavily infused with water, gases, mineral salts, and miscellaneous materials from the re-active sand bore. Some leakage from such sites is present in practically every district where exploratory wells have been drilled and abandoned.

Evidence of reservoir leakage does not imply that all plugged dusters become re-active. Possibly less than 10 percent of such abandonments leak sufficiently to damage a future location. Even a fraction of this low percentage is quite capable, however, of causing fishing jobs, tool breakage, or rig delay, any of which may add hundreds, perhaps thousands of dollars to the expense of completing a new well. As a precautionary measure, all non-productive sand bores should be plugged immediately following completion, and plugging measures should be carried out in accordance with the nature of the rock at the point of drill-penetration.

Physical characteristics are best observed by analysis of cores taken during the "drilling in" process, and plugging techniques should be arranged to comply with the disclosed strata variants as far as field conditions will permit. Lawful plugging rules and regulations, established for a district in general, need not be altered basically to accomplish a permanent seal

INSWELL
DOUBLE-DUTY
STEEL CHAIN

WHAT DO YOU ASK FOR IN CHAIN?

SAFETY to men and materials?

LONG SERVICE LIFE under exposure to abrasion and weather?

ECONOMY in first cost or "services rendered?"

EASE OF HANDLING by reason of non-kinking, short link design?

● **SPECIFY INSWELL**

Double-Duty High Test Chain and you have *all* of these advantages working for you. Our best customers are those who gave Double-Duty Chain the "on-the-job" test.

WRITE US *for the name of the distributor nearest your office or field operations.*

COLUMBUS McKINNON
CHAIN CORPORATION
(Affiliated with Chisholm-Moore Hoist Corp.)
GENERAL OFFICES AND FACTORIES: TONAWANDA, N. Y.
SALES OFFICES: New York • Chicago
Cleveland • San Francisco
Other Factories at Angola, New York,
St. Catharines, Ontario and Johannesburg, S. A.

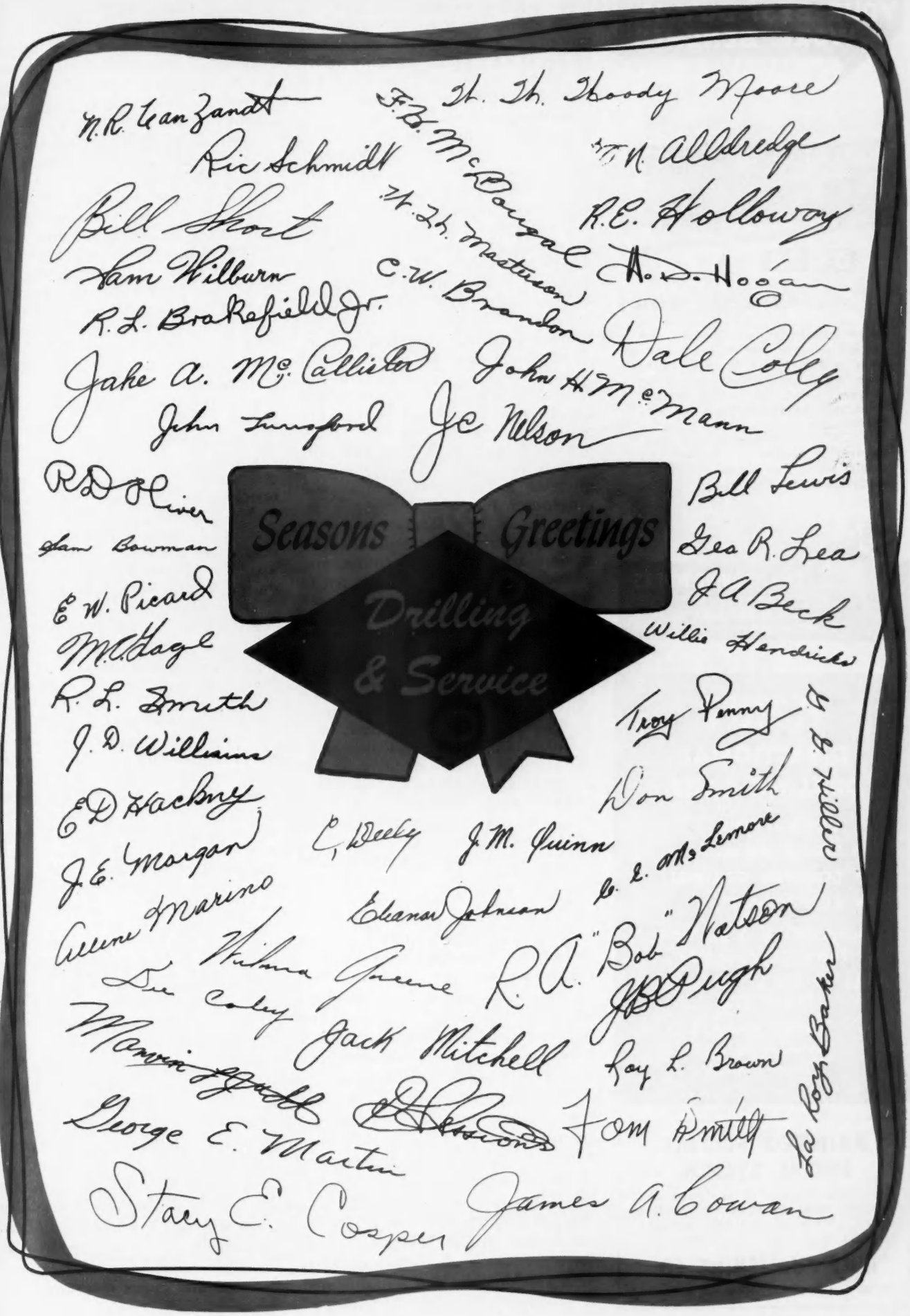
on a duster. However, some auxiliary measures are necessary, and exploratory operators who have been alerted to the potency of ineffective plugging now agree that during an abandonment procedure, special attention is essential at: (1) final reducing point, which constitutes the plug-shoulder at, or near the sand-top; (2) stretch of bore between plug-shoulder and base of sand.

After the annulus has been cleared of casing or other impediments and made reasonably dry, the second measure is carried out first by introducing the prescribed filler material as dry as possible into the sand bore. The necessary mixing fluid should be chlorinated water or a dense solution of salt brine. Raw, or surface water, generates air bubbles within a filler mixture, thus holding its constituents apart. Semi-solid and resilient fillers such as plastic clay mixtures, pulverized wood, or a gel-type cement and lime combination are preferred by most pluggers, since such materials unite favorably with variable formations, and are particularly adapted to bores where pay horizons are entirely absent. Unless bores have been fractured excessively by nitroglycerin, filling material is introduced generally by dump shell or bailer. A 3½-inch diameter dump shell, 25 to 35 feet long, proves very satisfactory for such work, and only a few runs are necessary to fill a bore of average length and capacity. The column of filler, as introduced, is tamped firmly into position, up the stretch of bore to the plug shoulder, and all excess water or mixing fluid is bailed off. Oil and greasy residue is especially treacherous at the top of a filler-column and should be swabbed off.

Seating Plug

For permanency, a plug must be seated in the top of a petroliferous formation, and not in a shell, some distance above or below the top. The position of formation domes in dry and disrupted areas is often miscalculated because many of the upper pay zones are reduced in thickness, or are missing entirely. In practically all cases, however, there is fragmentary evidence of their existence, such as segments of cap-rock, sand deposits of normal texture, etc., and such evidence must be ascertained from frequent bore samples, so that a fairly accurate plug position can be determined. Plugs seated low in a formation allow fluids and gases to escape from upper horizons into the annulus. The same horizons can likewise be flooded by drainage down the annulus. Plugs set too high permit the release of pressures into any porous strata which overlies the structure.

Where no suitable plug shoulder exists, one can be made by bridging the bore with cement slurry at the designated point, then drilling the bridge through with a small diameter bit, after the slurry has attained its initial set. Shoulder construction is rarely required, however, because most plugging points can be stiffened and the plug-retaining radius made more compact by the use of firming additives. The procedure is to release a quantity of plastic compound or cement slurry upon the top or summit of the filler which has been tamped into the bore, allowing the inserted mixture to extend a foot or two above the shoulder. Into this material, a plug of required length and diameter is dropped. Regulation plugs are generally composed of steel, or a metal alloy, chemically treated against corrosion, and tapered designs are preferred for variable strata because clayey, or spongy walls are inclined to cause bridging of spherical designs. In some formations, expanding plugs are necessary, especially in creviced or broken shoulders. Damaged shoulders, however, should be built up, or repaired with cement, before any plug is dropped. Old-type wooden plugs should never be used in variable strata, unless they are backed up by 10 to 20 feet (linear measurement) of cement. Steel line measurements are necessary in determining the destination of dropped plugs, since a miscalculation of only a few inches is often sufficient to cause the abandonment to become a leaker. Where accurate seating is questionable, the plug must be tamped into position. After binding material (slurry) has attained its initial set, the annulus is filled in above the plug and tamped at intervals to assure compactness. Pulverized clay, wetted to spongy consistency, is generally used in filling an annulus, and precautions are necessary to prevent bridging. Where the caving of walls is inclined to cause bridging immediately above a seated plug, a quantity of granular salt is often added to the filler material, the usual ratio being 100 pounds salt to each 100 pounds of filler. Other field-proven additives are gypsum, calcium, chalk, wood ash, and silica-gel. All materials utilized as fillers should be powdered or pulverized. Metallic residues and sludges are to be avoided. Gravel, cinders, rock segments, wood, or surface trash should never be dumped into an annulus and fillers should never be allowed to become coarse as diameter of the bore in-


Seasons Greetings
Drilling & Service
N. R. VanZandt
Ric Schmidt
Bill Short
Sam Wilburn
R. L. Brakefield Jr.
Jake A. McCallister
John Lunsford
F. B. McDougal
H. H. Mattison
C. W. Brandon
John H. McMann
J. C. Nelson
H. H. Moody Moore
W. N. Aldredge
R. E. Holloway
A. D. Hogan
Dale Colby
R. D. River
Sam Bowman
E. W. Picard
M. Hagel
R. L. Smith
J. D. Williams
E. D. Hackney
J. E. Morgan
Irene Marino
Lee Colby
Wilma Greene
Jack Mitchell
Marvin Gadd
George E. Martin
Stacy E. Cooper
Bill Lewis
Geo R. Lea
J. A. Beck
Willis Hendricks
Troy Penny
Don Smith
L. Deeley
J. M. Quinn
Eleanor Johnson
E. E. McLemore
R. A. "Bob" Watson
J. B. Pugh
Roy L. Brown
Tom Smith
James A. Cowan
L. Roy Baker
L. L. Miller

YOUR BEST BUY IN WORK BENCHES

OWEN

. . . standard of the industry

These outstanding, all-steel work benches are now manufactured exclusively by Beacon Mfg. Co. Built to the same rigid specifications as set by "Whitey" Owen, they're still the best buy possible in oil field tool and work benches.
BUY OWEN Work Benches . . . manufactured by Beacon . . . through your supply store. Two sizes, to fill all requirements, are available.

L&H MACHINE WORKS
2205 Quitman Houston, Texas
EXPORT: Baird Supply Co., Inc.
420 Lexington Ave., New York, N. Y.

KERN
DIRECTIONAL
DRILLING CORP.

- SIDETRACKING
- STRAIGHTENING
- CONTROL DRILLING
- CONSULTING

HOUSTON: P. O. Box 8055
Phone: KEystone 6123
ABILENE: G & L Tool Company
Phone: 5555
CORPUS CHRISTI
Specialties Warehouse
Phone: 3-4488

PRINTED FORMS
FROM STOCK

Immediate delivery of producing and pipe line forms made from our complete line . . . Write for completely illustrated catalog.

GULF PUBLISHING CO.
P. O. Box 2608 Houston 1, Texas

creases. It is also important that annulus filling be made a continuous procedure, and the bore not permitted to remain open, partially filled, for weeks or months. The most approved practice is to complete an abandonment before the drilling rig is moved from over the site.

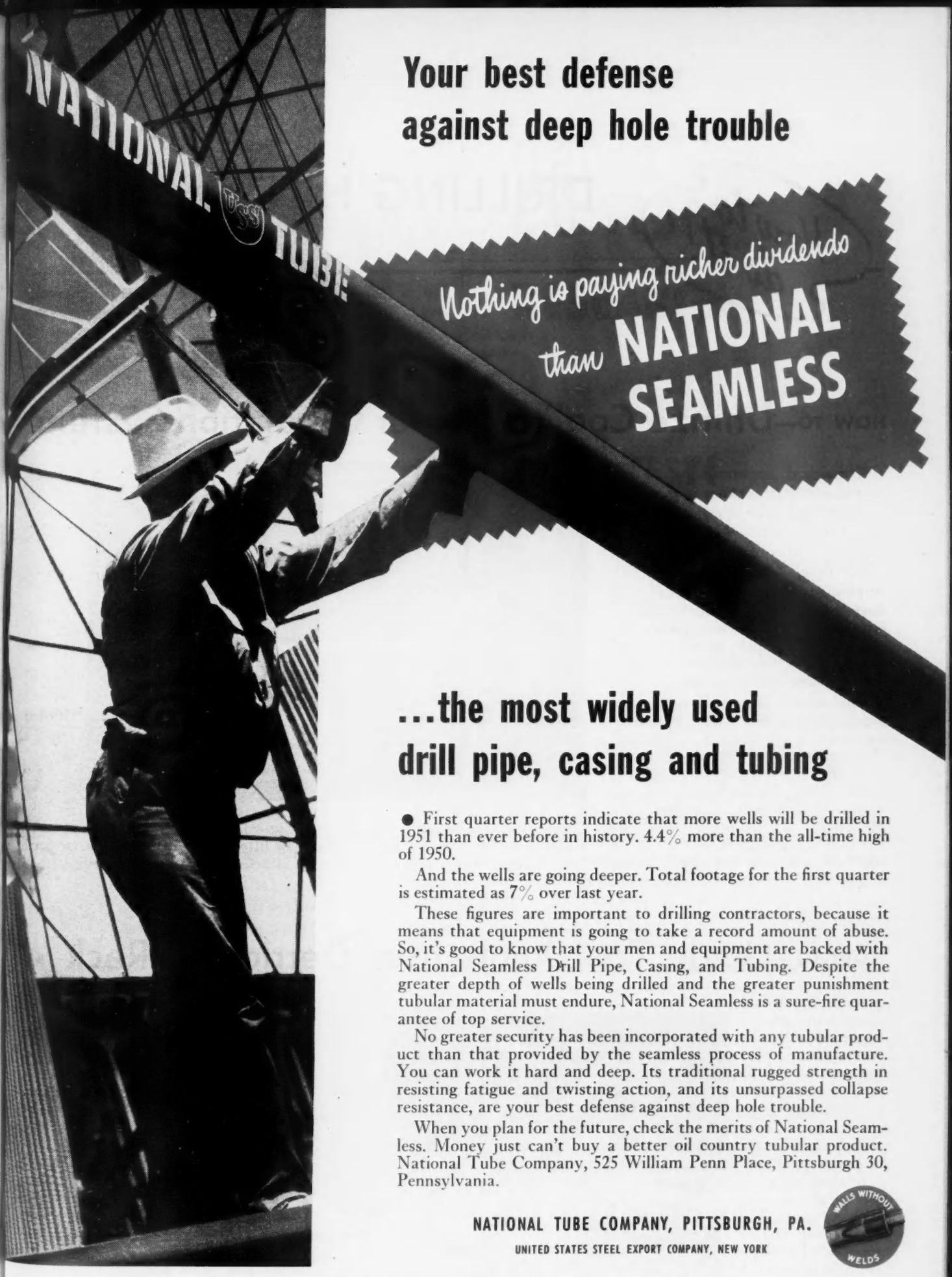
Bores of many dusters penetrate one or more oil-bearing formations during the course to a base pay, and when these likewise prove non-productive, a geologic course, quite similar to that of a base pay, is observed almost invariably, inasmuch as the structure is disrupted and many of its constituents displayed by resilient materials. Non-productive strata encountered in upper stretches of bore often prove more potent than deep strata, since there is less overburden to limit the distribution of fluids and gases. One foot of unsealed structure at such critical horizons may readily cause 100 or more feet of bad hole in a new, nearby drilling. Accurate plugging is therefore essential, and procedures followed are identically the same as those carried out in the base pay. Some of these shallow formations are shelly or cavernous, and in such instances it is customary to spray the bore walls heavily with cement before the regulation filling material is introduced. All bore space between plugged formations must be filled in and tamped. Excess water, oil, or mixing fluids should be kept bailed or swabbed off as the column of filler extends up the bore, and frequent tampings are essential until the filling-in job is completed at the mouth of the annulus. The final procedure is to spot the site, at the location, and upon the map, for future reference, and terminate the drilling log with a brief description of the pay formation plugged.

The quantity of oil lost in a given district by water encroachment from ineffectively plugged wells is considerably more than is generally realized, but its valuation, potentially, does not far exceed the cost of formation disturbances originating from the same source. These, likewise, are caused principally by water, laden with corrosive mineral salts and sedimentary deposits, elevated from a petroliferous reservoir, and distributed through receptive strata. Many subsurface formations, normally stable, undergo segmentation when infused with water, becoming soft and crumbly, with marked caving tendencies. Shales, slates, and similar laminated structures are chiefly affected. The radial area which can be thus contaminated is governed mainly by the extent of pressures within the reservoir, and the nature of the pores, or capillary system of the strata infused. Ample evidence of infusion from a reservoir has been encountered in new drillings as far as 3000 feet from a leaky abandonment.

The magnitude and general prevalence of reservoir disturbances received but meager recognition in oil circles until less than three years ago when instances and reports of abnormal strata conditions became sufficiently numerous as to cause more intensive study and investigation. Undoubtedly, considerable widespread damage has already occurred, and a high percentage of it has originated from improperly plugged bores which were found nonproductive upon completion. Only a very few such abandonments can be re-opened and repaired.

The addition of any extra time and expense to an abandonment procedure may seem impractical to the operator or contractor who is still under the impression that a formal plugging process which proves successful on a drained-out producer is appliable identically to a natural duster. This belief is contradicted by the fact that productive wells generally occur in normal structure where uniformity of composition is sufficient to constitute a fairly accurate plugging pattern for a given district. Disorganized structure in which dry holes generally occur has no such pattern except that one or more of the major components are impregnated with, or displaced entirely by, resilient materials, principally clay. Some discrimination in plugging is therefore necessary, and effective dry-hole sealing requires the use of techniques and materials compatible with the structure involved. In a practical sense, plugging constituents must blend and unify with constituents present, locally, in the formation.

Providing that disorganized structure is recognized at bore completion, and prompt arrangements made for its plugging, all auxiliary materials and labor necessary for the average job rarely add more than $50 to the cost of an abandoning routine. A treacherous annulus thus sealed and fortified remains impotent, regardless of whatever oil recovery measures or processes are later used against it. This type of abandonment is essential wherever new drillings are made, but is particularly important in wildcatted or partially developed fields where formation behavior is not clearly understood and divers mechanical risks are necessary in locating an oil reserve.



Your best defense against deep hole trouble

Nothing is paying richer dividends than **NATIONAL SEAMLESS**

...the most widely used drill pipe, casing and tubing

● First quarter reports indicate that more wells will be drilled in 1951 than ever before in history. 4.4% more than the all-time high of 1950.

And the wells are going deeper. Total footage for the first quarter is estimated as 7% over last year.

These figures are important to drilling contractors, because it means that equipment is going to take a record amount of abuse. So, it's good to know that your men and equipment are backed with National Seamless Drill Pipe, Casing, and Tubing. Despite the greater depth of wells being drilled and the greater punishment tubular material must endure, National Seamless is a sure-fire guarantee of top service.

No greater security has been incorporated with any tubular product than that provided by the seamless process of manufacture. You can work it hard and deep. Its traditional rugged strength in resisting fatigue and twisting action, and its unsurpassed collapse resistance, are your best defense against deep hole trouble.

When you plan for the future, check the merits of National Seamless. Money just can't buy a better oil country tubular product. National Tube Company, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

NATIONAL TUBE COMPANY, PITTSBURGH, PA.

UNITED STATES STEEL EXPORT COMPANY, NEW YORK

WALLS WITHOUT WELDS

USS

NATIONAL SEAMLESS DRILL PIPE, CASING AND TUBING

UNITED STATES STEEL

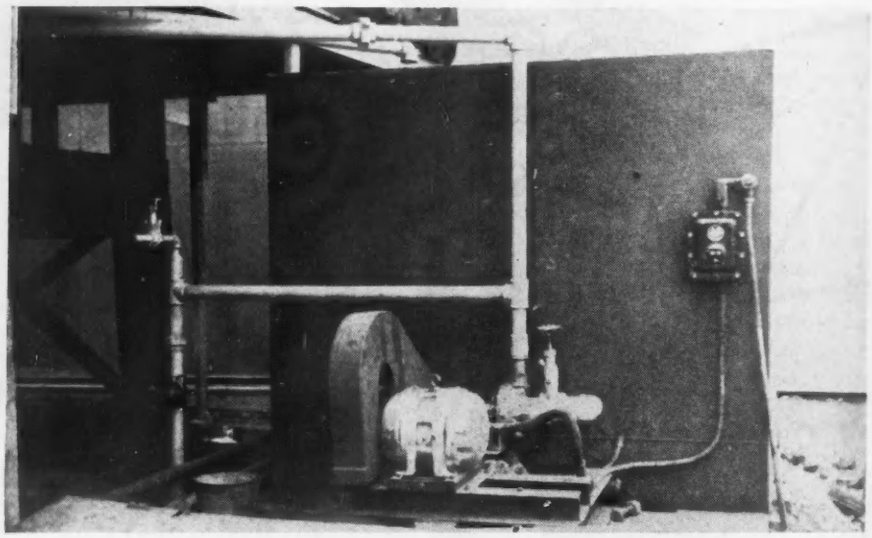
How to do it!

DRILLING HINTS

$10 is paid for each illustrated acceptable contribution. Mail to The Editor, WORLD OIL, P. O. Box 2608, Houston 1, Texas

HOW TO—Unitize Cooling Water Circulation System

A unitized apparatus, which requires only one breakout in pipe connections and one electrical connection, is being used to circulate water through brakes on a rotary rig in Long Beach, California. The unit consists of a rectangular supply tank having ample capacity for all anticipated requirements for cooling, together with a supply of water for all floor washing, and rinsing tool joints when coming out of the hole.

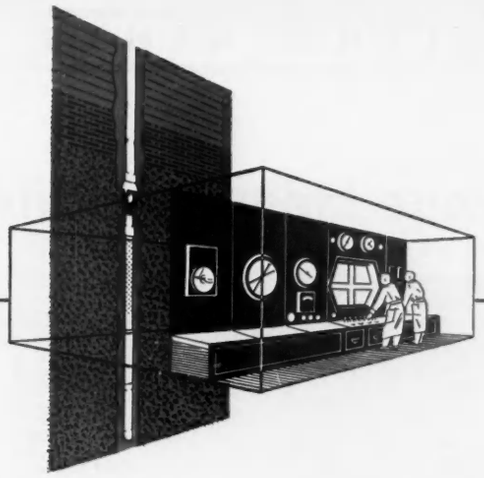


This tank is mounted on a conventional skid base with the runners extending forward as a support for the motor driven centrifugal pump. The piping is connected or disconnected from the discharge fitting of the pump with only one ground joint lip union. The control switch for the motor is mounted on the face of the tank wall near the pump where fittings are installed to make lead-in connections for power. This unit has been designed for a minimum of occupied space, and arranged so it can be lifted easily with a crane, or boom attached to an oil field service truck.

HOW TO—Guide Tool Joints from Derrick To Rack

Drill pipe is laid down with greater speed and with less damage to tool joints when a chute is used. This piece of equipment is made as a long trough, constructed of heavy pipe split lengthwise, supported at each end with A frames. The end resting on the pipe walk has a specially reinforced A frame with braces to prevent crushing when a long joint of heavy pipe comes in contact with the apparatus.

At the end resting on the derrick floor, the entrance to the chute is provided with a roller to guide the pipe into the trough as it is swung outward from the hole. The pin end slides well outward before movement is halted so the highline sling can be attached readily. When the joint is hoisted from the floor, the chute guides the box end outward from the derrick where it loses altitude quickly and drops to the pipe walk with only a foot of free fall. Besides protecting the tool joints and the walk, laying down the string can be done rapidly and racked in less time than when pipe is handled conventionally.



25 YEARS RESEARCH

one of many reasons why HALLIBURTON'S *best*

for your DRILL STEM TEST!

You want the best drill stem test — AND THIS IS IT — for Halliburton ALONE offers you a testing service developed and improved by 25 years of energetic research.

Advanced and highly specialized tools are a result of this grass-roots research. Roughnecks on the rigs had a hand in it. So did white-jacket wizards in big modern labs. Their contribution to Halliburton's present-day equipment includes the new curved J-slots, automatic locks, adjustable chokes, special-duty packers, multi-purpose circulating valve, and other features that make misruns a rarity with Halliburton.

You get far greater accuracy in pressure recording from Halliburton's exclusive Bourdon Tube. The absence of packing glands in this instrument makes it much more sensitive to slight variations of pressure than other types. Operators who know about it won't have anything else. Halliburton ALONE offers you the B.T. Pressure Recording Device . . . at no extra cost.

Research is responsible for the superior knowledge, experience, and efficiency of each Halliburton Tester. It keeps him ahead of the industry's requirements and enables him to handle your test no matter how deep the well, how high the pressures, or temperatures.

Halliburton's consistent research, the ONLY big testing research program in the industry, will continue to develop and improve its testing equipment and methods. It's your firm assurance that Halliburton's best for your drill stem test — today, tomorrow, and the years ahead. Get Halliburton's exclusive features on your next drill stem test. **HALLIBURTON OIL WELL CEMENTING COMPANY, DUNCAN, OKLAHOMA.**

★

MORE REASONS WHY HALLIBURTON'S best:

YOU'RE ONLY MINUTES AWAY!

Halliburton has hundreds of highly-trained Testing Specialists experienced in every type of well. One of these Testers is only minutes away.

YOU GET REAL PERSONAL SERVICE!

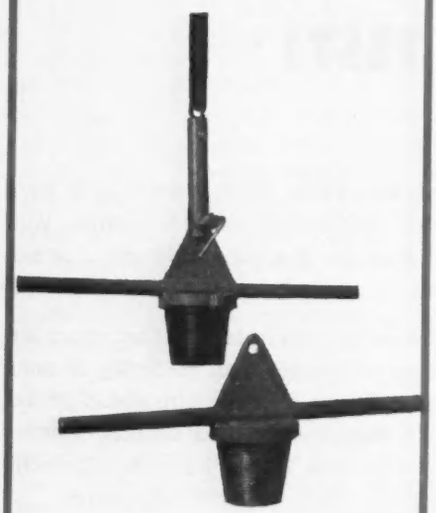
Your Tester stays on the rig from start to finish of your test — giving you his full-time attention during this highly important operation.

YOU'RE SURE IT'S AVAILABLE!

Each Halliburton Tester is completely equipped with the latest tools and ready to go as soon as you call. Phone him before you come out of the hole.

HALLIBURTON YEARS AHEAD IN DRILL STEM TESTING!

Keep the
Derrick Man
Where He Belongs
by using
LONE STAR
Automatic
SAFETY PLUGS



Many rigs have burned as the result of the spray of oil during drill stem tests, and many lives have been lost during this phase of operations.

You can insure automatic control of oil, save time, and "keep the derrick man where he belongs," by using LONE STAR AUTOMATIC SAFETY PLUGS, which require no manual handling above the floor. Experience has proved them highly successful.

Write for full particulars.

P. O. Box 848

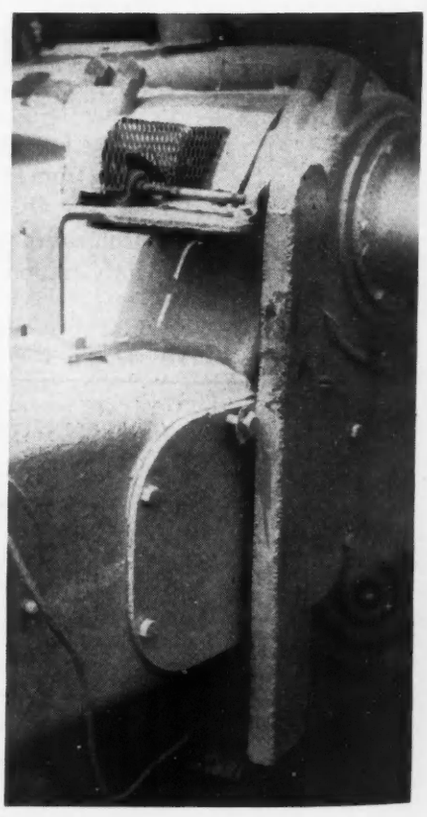
LONE STAR TOOL CO.
WICHITA FALLS, TEXAS

HOW TO—Salvage Heavy Additives

Waste of drilling fluid has been encountered in various areas of California due to pulling wet strings and loss from shakers. From time to time, expensive materials are added to the mud. Such additives may be recovered with a wide flume equipped with riffles to retard the flow and permit precipitation of the heavy additives.

Excavated beside the rig is the flume, a wide ditch into which the refuse of the shakers is dumped from the screen aprons. The ditch is lined with planking stiffened with 2 x 4's as studding, and the riffles are installed at each second studding, or rib, to force the flow of fluid and shales to pass over each successive riffle until the ditch empties directly into the regulation shale pit.

HOW TO—Drive Lubricating Pump



A light duty, rotary pump can be installed on a power mud pump for circulating oil over the rods. One operator has made this installation by cutting a window in the case opposite the drive shaft above the cross head. A bracket, designed to support two small pillow blocks, is attached to the pump gear housing with adjustable clamps which permit application of tension against the belt drive.

The jack shaft is equipped with two sheaves, one acting as a drive pulley and the other transmitting power to the circulating pump. V-belts operate from each pulley.

The circulating pump is mounted directly below the jackshaft on a pedestal which is attached to the structural steel skid foundation of the mud pump. Positioned in this manner, it is easy to service the circulating pump.

A sheet metal reservoir is attached to the skids immediately below the pump bed. A center baffle is welded in the reservoir to allow an accumulation and separation of water from the lubricant. Copper tubing connects the pump, reservoir and directs a flow of oil over the mud pump rods.

What do his figures tell him about this rope ?

Since the day it was installed, he's kept a brief record of this wire rope's performance. The black book tells him the date it went to work, the type of work it's doing, and roughly just how much it does each day. When the rope is retired from service, he'll be able to say whether it's done a good job for him—given him his money's worth.

Smart man! For of course he isn't keeping tabs on just this one rope. He follows the system with all the major wire ropes he buys. And why? Because he learned years ago that you can't compare brands of rope by guessing—by vague, hit-or-miss estimates.

Bethlehem earnestly recommends that you, too, keep figures on rope performance. Nothing elaborate—something that costs you only a few minutes' time each day. You see, we're so confident of our own product, Bethlehem wire rope, that we'd like to have you check it yourself. Stack it against the competitive brands of your choice. Keep records on all of them!

When you've been doing it long enough to make a comparison, study those figures. They'll tell you that every dollar invested in Bethlehem rope is money well spent . . . that you can't buy finer rope anywhere.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation

LET YOUR RECORDS TELL YOU!

Wherever the world-wide search for oil might take your drilling operations, make Christensen Diamond Products your standard guide for dependable Diamond Drill Equipment.

The design, engineering and manufacture of all Christensen Diamond Products are performed by experts with long experience in these fields.

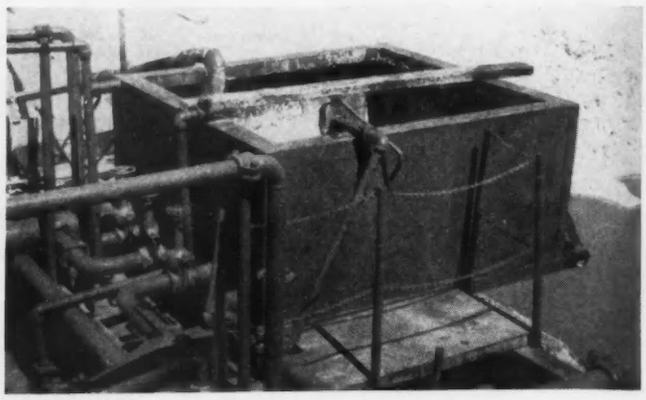
Christensen Diamond Bits mean Top Performance . . . you can expect added footage, greater efficiency in operation and maximum recovery of diamonds for resetting.

SEE OUR CATALOG IN SWEET'S CATALOG

CHRISTENSEN DIAMOND PRODUCTS

CHRISTENSEN
DIAMOND PRODUCTS CO.
1937 SOUTH SECOND WEST
SALT LAKE CITY, UTAH

HOW TO—Avoid Drilling Fluid Loss



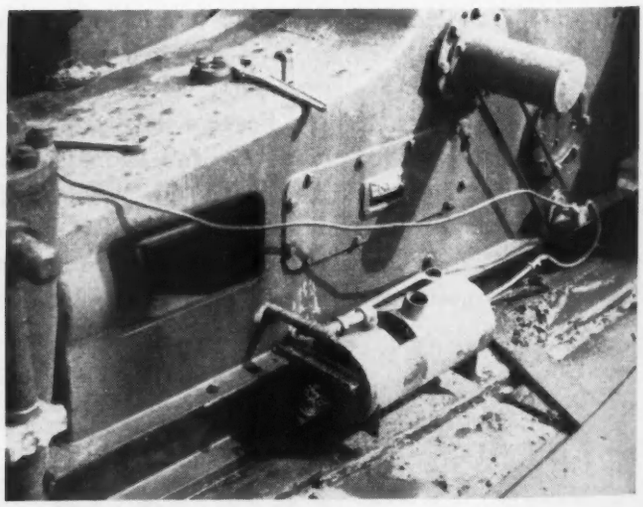
Splashing, and consequent waste, of drilling fluid from the hydrator can be eliminated through installation of a simple retaining edge.

The tank wherein dry mud is mixed with water is a square vessel ordinarily reinforced at the top with a band of steel, or with angle iron to form a flat rim to support pipe and other equipment. An improved method of reinforcing is to set the angle iron with the inside of the angle facing the walls of the tank to form a long, open, box-like rim.

When the fluid meets the inside rim during the turbulent mixing process, it is forced down again into the bulk of the mix.

A further addition to the mixing tank at this installation is a swivel-mounted nozzle attached to a gun line with a handle. The operator can play the force of fluid toward any point in the tank while he stands on the grated platform inside the guard rail.

HOW TO—Circulate Rod Lubricant



A piston rod lubricating unit, which contains only the piping necessary to obtain adequate circulation is placed where it becomes an integral part of the pump whether operating or on the road. The reservoir is made from a 12-inch pipe nipple with both ends welded oil tight.

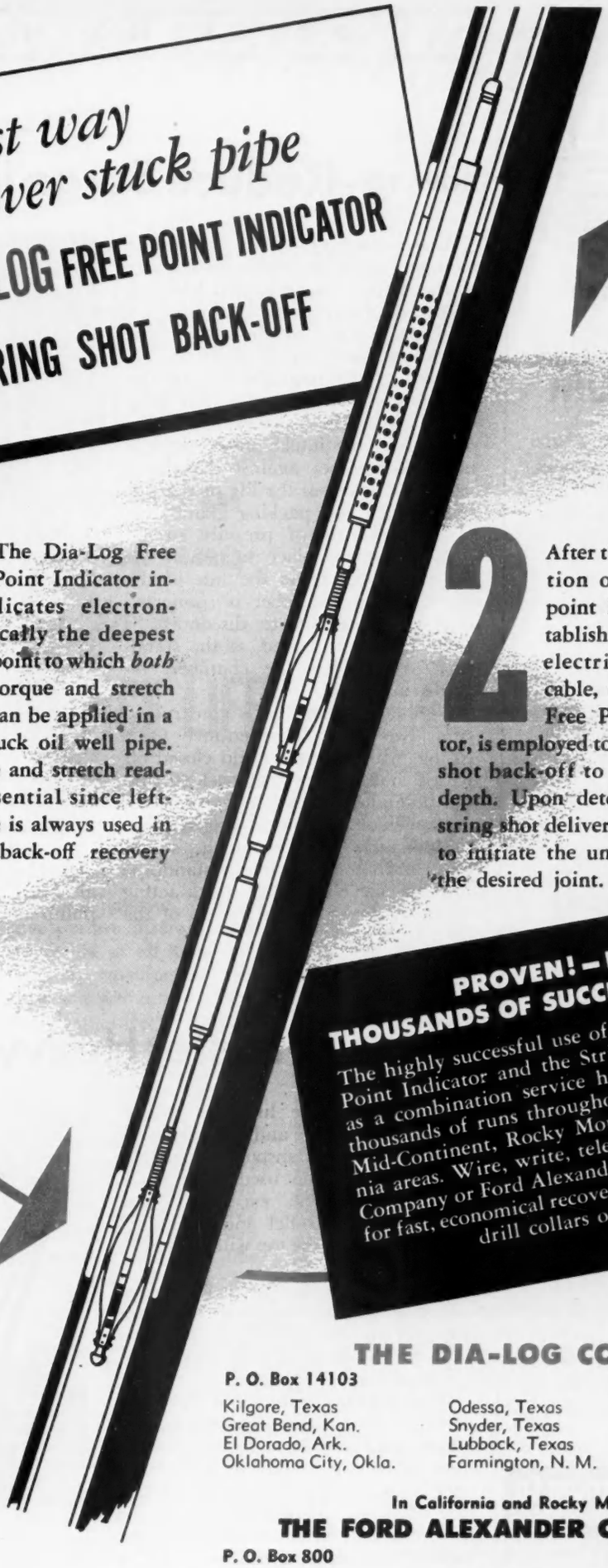
Only three connections are attached to the reservoir; the inlet in the top, a drain at one end, and the sunction above possible water level. It is attached permanently to the base of the pump with brackets and the small rotary pump is connected to the same bed plate with 'C' clamps to allow proper belt adjustment.

Fluid is delivered throughout the system by means of oil-proof rubber hose and copper tubing. Lubricant is added to the reservoir through a slotted opening in the top.

The fact that the unit is attached to the pump bed eliminates the necessity of removing the unit prior to rig transport.

the fastest way to recover stuck pipe

1. THE DIA-LOG FREE POINT INDICATOR
2. THE STRING SHOT BACK-OFF



1 The Dia-Log Free Point Indicator indicates electronically the deepest point to which *both* torque and stretch can be applied in a string of stuck oil well pipe. Both torque and stretch readings are essential since left-hand torque is always used in subsequent back-off recovery operations.

2 After the exact location of the stuck point has been established, the same electric conductor cable, used for the Free Point Indicator, is employed to run a string shot back-off to the desired depth. Upon detonation, the string shot delivers a sharp jar to initiate the unscrewing of the desired joint.

PROVEN! — BY THOUSANDS OF SUCCESSFUL RUNS

The highly successful use of the Dia-Log Free Point Indicator and the String Shot Back-Off as a combination service has been proved in thousands of runs throughout the Gulf Coast, Mid-Continent, Rocky Mountain and California areas. Wire, write, telephone any Dia-Log Company or Ford Alexander Corporation office for fast, economical recovery of stuck drill pipe, drill collars or tubing.

OIL WELL ELECTRIC LINE SERVICES

THE DIA-LOG COMPANY

P. O. Box 14103 — **Houston, Texas**

Kilgore, Texas
Great Bend, Kan.
El Dorado, Ark.
Oklahoma City, Okla.
Odessa, Texas
Snyder, Texas
Lubbock, Texas
Farmington, N. M.
New Iberia, La.
Houma, La.
Corpus Christi, Texas
Natchez, Miss.

In California and Rocky Mountains

THE FORD ALEXANDER CORPORATION

P. O. Box 800 — **Whittier, California**

Ventura, Calif. • Taft, Calif.

Merry Christmas

SAND-BANUM

Pure Colloidal Concentrate

Removes and Prevents Boiler Scale

Use Ounces Only Once a Week

•

SAND-BANUM SPECIAL

The Concentrated Colloidal Tablet Removes and Prevents Rust and Scale in ALL Radiator Cooling Systems

•

SAND-BANUM Products Save You Money and Help Keep Your Equipment Merry All Year 'Round

•

Stocked By Leading Supply Houses

•

Descriptive Literature On Request

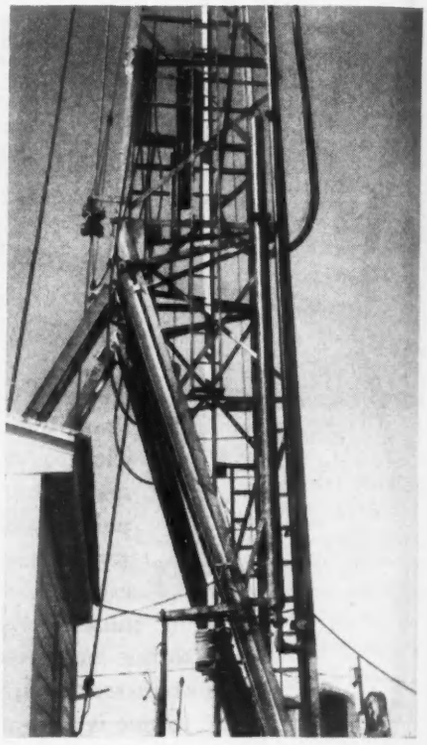
AMERICAN SAND-BANUM CO.
Established 1915
9 Rockefeller Plaza
New York 20, N.Y.
SAND BANUM

HOW TO—Reduce Surge in Mud Line

A permanent surge chamber mounted in the standpipe on the side of the derrick prevents mud hammer in the discharge line. This produces a steady pressure on the rotary hose and mud lines and increases the efficiency of the mud pumps. It also increases the life of the discharge valves since the pressure is leveled off and on the intake stroke there is no back hammer against the closed valves. It increases the life of the piston rubbers and packing glands due to the lowering of pressure surges.

A convenient place to mount the surge chamber is on the side of the rig. Once the chamber is connected it is not necessary to disconnect it when the rig is moved, as the standpipe, as well as the chamber, remains in place.

The surge chamber is constructed from two joints of seven-inch O.D. casing, with the upper end closed off with a bull plug. A bail welded into the bull plug is used in hoisting the vessel. The lower end is swaged down to four-inch, the size of the standpipe, and connected to the standpipe through an ell and a quick-acting union as shown. With the tip of the



pipe closed, it remains full of air at all times and the surges of the mud pump are reduced.

HOW TO—Transfer Heavy Equipment

A dual purpose highline post is being used to load and unload heavy material from a transport truck. It is similar to a boom used on a truck with a winch line, except the side members are parallel and connected to each other at the top with a straight cross member.

Gusset plates are welded into the point of contact between the cross member and the side members to provide greater strength and insure adequate stability.

Like a truck boom, it is equipped with braces to adjust for the desired angle, and the bottom ends of all four posts are attached to the steel side rails of the pipe walk. Hinges are attached to the top ends of the braces at the contact between the ends and the highline parallel posts to provide movement when making the

adjustment. Several holes are drilled in the side rails of the walk so the

CAN YOUR ROTARY HOSE BE REPAIRED?

GOODALL LONG-LIFE ROTARY HOSE...

with the Built-in Barney Coupling

Gives You

DOUBLE SERVICE LIFE

Times like these especially . . . with steel and rubber on the critical list . . . test the maximum life of all types of equipment.

In the case of rotary hose, however, Goodall Rotary Hose owners have positive assurance that they will receive maximum life at all times . . . because Goodall is the only manufacturer that protects rotary hose investments with a time-proved maintenance policy. Goodall can offer this money-and-equipment saving policy because only Goodall Rotary Hose has the Barney Coupling, the first and only rotary hose coupling that can be reset to save your hose from the scrap heap.

That's why we say to all Goodall Rotary Hose owners: ***Never Discard a Goodall Rotary Hose until you contact us.*** And that's why we want to suggest to all rotary hose users: ***Why buy any other rotary hose that does not give you this Goodall combination of extra long life with extra protection for your investment?*** Thanks. Barney.

COUPLING—The original Barney Coupling is the only coupling that is stronger than the hose itself. It is the only coupling that can be reset to save your hose from the scrap heap.

CORD CONSTRUCTION—Goodall's flexible cord design provides the extra strength to withstand torsional twist . . . thus eliminating the cause of more than 90% of rotary hose failures.

FLEXIBILITY—Goodall Long-Life can be coiled into a convenient unit for transporting without slightest damage.

PERFECT BALANCE—The Goodall method of winding the multiple cords of the carcass and the steel cables of the pressure element at corresponding angles assures perfect balance.

GREATER STRENGTH—By actual test, Goodall Long-Life is the strongest hose ever built and it retains its strength better than any other hose.

REPAIR SERVICE—Goodall Rubber Company is the only rotary hose manufacturer that can protect your investment with a maintenance plan. Goodall maintenance provides a repair department in Houston where any length of Long-Life that meets with an accident can be renewed for the rest of its normal life. No length of Long-Life repaired in our shop has ever failed in service.

SALVAGE VALUE—Substantial allowances are made on every set of Barney couplings returned.

NO PREMIUM PRICE—The extra quality, longlife and high salvage value of Goodall Flexible Cord costs no more than ordinary rotary hose.

GOODALL RUBBER COMPANY

TRENTON, N. J.

GOODALL RUBBER COMPANY OF TEXAS: Houston, Texas.
GOODALL RUBBER COMPANY OF CALIFORNIA: San Francisco, Los Angeles, Seattle, Salt Lake City, Portland.
GOODALL RUBBER COMPANY: New York, Philadelphia, Pittsburgh, Chicago, Denver, St. Paul, Detroit.
EXPORT: Goodall Rubber Company, Trenton, N. J.
DISTRIBUTORS: Texas and Louisiana — Houston Oil Field Material Co.; Wilson Supply Co.
Oklahoma — Iverson Supply Co.

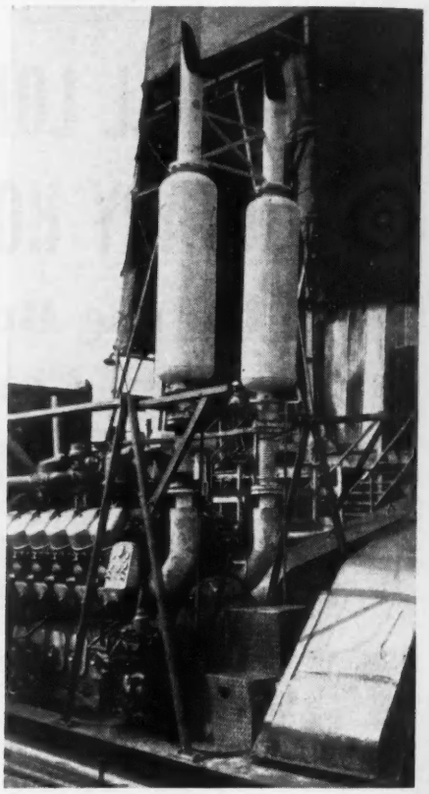
GOODALL HAS BEEN **FIRST** WITH EVERY WORTHWHILE ROTARY HOSE DEVELOPMENT

highline post can be set vertical, extended backward over a truck, or laid down flat on the walk.

The sheave running on the high line has a hook that can be run out to pick up loads from a truck and brought directly to the derrick floor with the catline. Bits, subs and the like require only one handling as they move directly to the derrick floor, instead of to a tool dock then picked up for transfer to the floor.

HOW TO—Support Engine Mufflers

A contractor in the Long Beach area of Southern California makes use of every short-cut possible to reduce the time of rigging up, tearing down and shipping tools. Among these methods is a permanent support for twin mufflers on 12-cylinder gas engines where the mufflers are installed in a vertical position directly above the clutch housing.



An A frame of two-inch pipe with foot pieces built at an angle are attached directly to the skid foundation of the engine. At the apex of the A frames, horizontal sections tie the supports together where the bottom flanges of the mufflers match the supports. Extensions at right angles provide additional rigidity, with two longer sections reaching from the supporting structure to the radiator cases.

Tail pipes are held together with a bridge work of X frame construction, while the vertical position is maintained with diagonal braces attached to the top of the mufflers at one end, and to the long horizontal braces at the other.

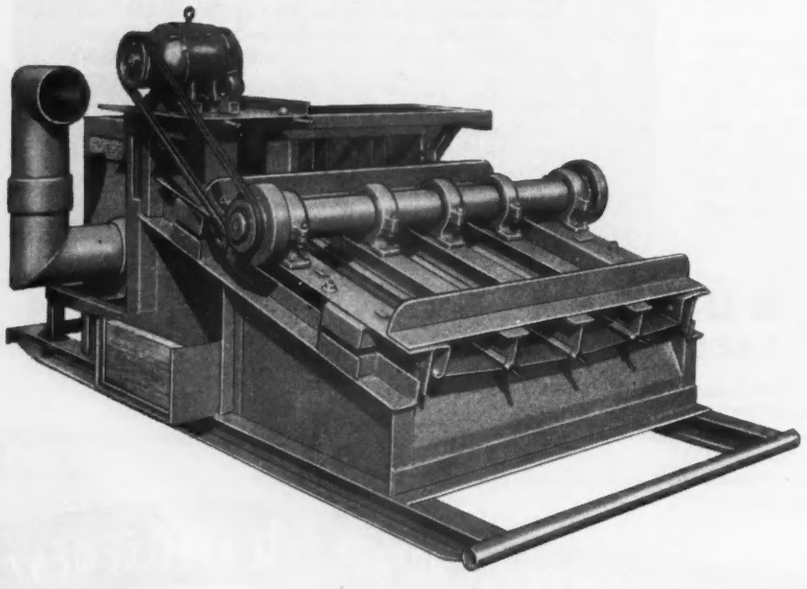
With this type of muffler support, it is unnecessary to dismantle the units except when performing maintenance work.

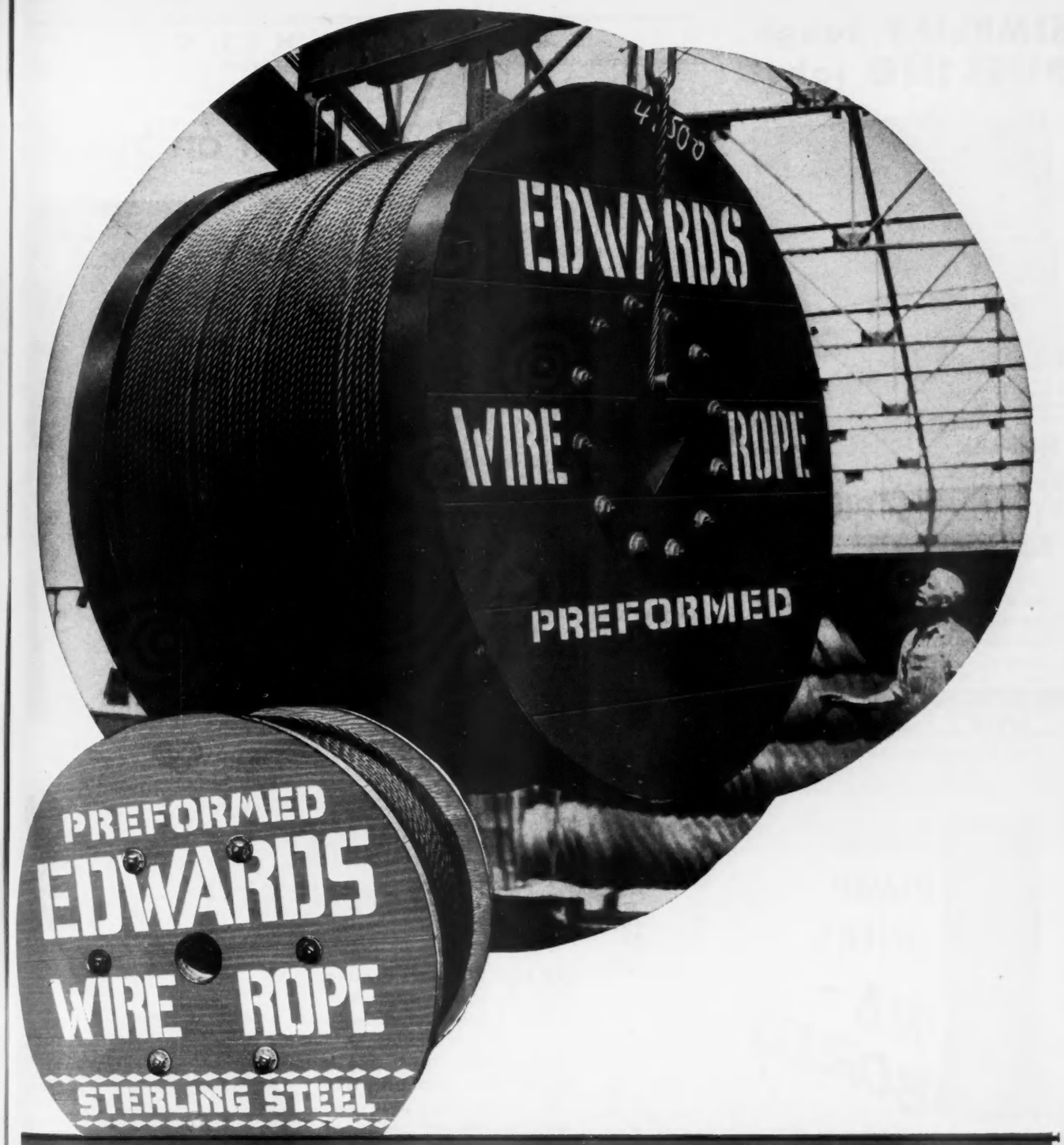
ITS RUMBA ACTION
REMOVES SAND AND SHALE
BY NEW FLOTATION PROCESS

...AND SCREEN CLOTHS LAST MORE THAN A YEAR!

"RUMBA" Shale Shakers excel in performance and low cost maintenance. They come to you completely unitized on 10 ft. skids . . . no rigging up costs in the field. The underslung screen cloth, with no obstructions on the bottom, removes sand by floating it out on the bottom of the cloth. This design contributes to the longer screen cloth life . . . one of the features that is causing the worldwide demand for "RUMBA" Shakers.

HUTCHISON MANUFACTURING COMPANY
6609 AVENUE U • HOUSTON 11, TEXAS





YOU CAN BET YOUR LIFE ON

EDWARDS
WIRE ROPE

Head Office: SAN FRANCISCO • Main Plant: SOUTH SAN FRANCISCO

Branch offices

SEATTLE • PORTLAND • LOS ANGELES • HOUSTON

Distributors throughout the West, Gulf Coast and Mid Continent

SIMPLIFY tough PULLING jobs!

Pull Rod or Screw Is Inserted through UNIQUE "CENTER-HOLE"* Ram plunger and is drawn in a straight, torque-free pull through Ram. Ram is its own back up! Less rigging time—more effective power!
10 to 100 ton capacities.
*"Center-Hole" in Rams of 30-ton and greater capacities.

SIMPLEX Re-Mo-Trol HYDRAULIC PULLERS

PUMPS AND REMOTE CONTROLLED RAMS

If it can be pulled, Re-Mo-Trol can pull it—easier and faster! Pulls liners, sleeves, shafts, gears, etc. SAFER remote control. Also lifts or presses. Can save its cost on a single tough job!

Simplex Screw Hydraulic Jacks

WRITE FOR BULLETIN: HYDRAULIC 51

TEMPLETON, KENLY & CO.

1032 So. Central Ave., Chicago 44, Illinois

SLUSH PUMP LINERS RE-BORED

TO ANY STANDARD SIZE
— WE DO THE JOB —
— RIGHT! —

NEW LINER GUARANTEE
65%
OF NEW LINER COST

Our Representative Will Be Glad to Call
Write to

WICHITA TOOL REPAIR CO.
104 Oak, P. O. Box 511
WICHITA FALLS, TEXAS

HOW TO—Keep Line Tight on Spool

A simplex jack, a piece of chain and a block of wood are the only equipment necessary to keep the derrick line taut while it is being spooled back on the drum after it has been removed for replacement or repair. It is essential that the line be tight to prevent it from "swarming" when the weight of the drill pipe is placed on it.

After the end of the line is fastened securely on the drum, the block of wood is laid on the derrick line and the jack set on top of the block. A short length of chain is then thrown under the floor of the walk and the ends are hooked together over the jack. It is then easy for the crewman to take a strain on the chain and hold a friction grip on the derrick line to make it spool tightly.

As the line is drawn through the space under the block, it gradually cuts into the wood, but another notch can easily be taken in the jack.

PEAK PERFORMANCE . . . LONGER!

For over 20 years drilling and pumping operators have had less "shut down time" with STITT "X" (sour gas) type spark plugs. Buy proven STITT "X" (sour gas) plugs, as well as regular plugs, at your supply store.

STITT spark plugs

MANUFACTURED BY
STITT IGNITION COMPANY, COLUMBUS, OHIO

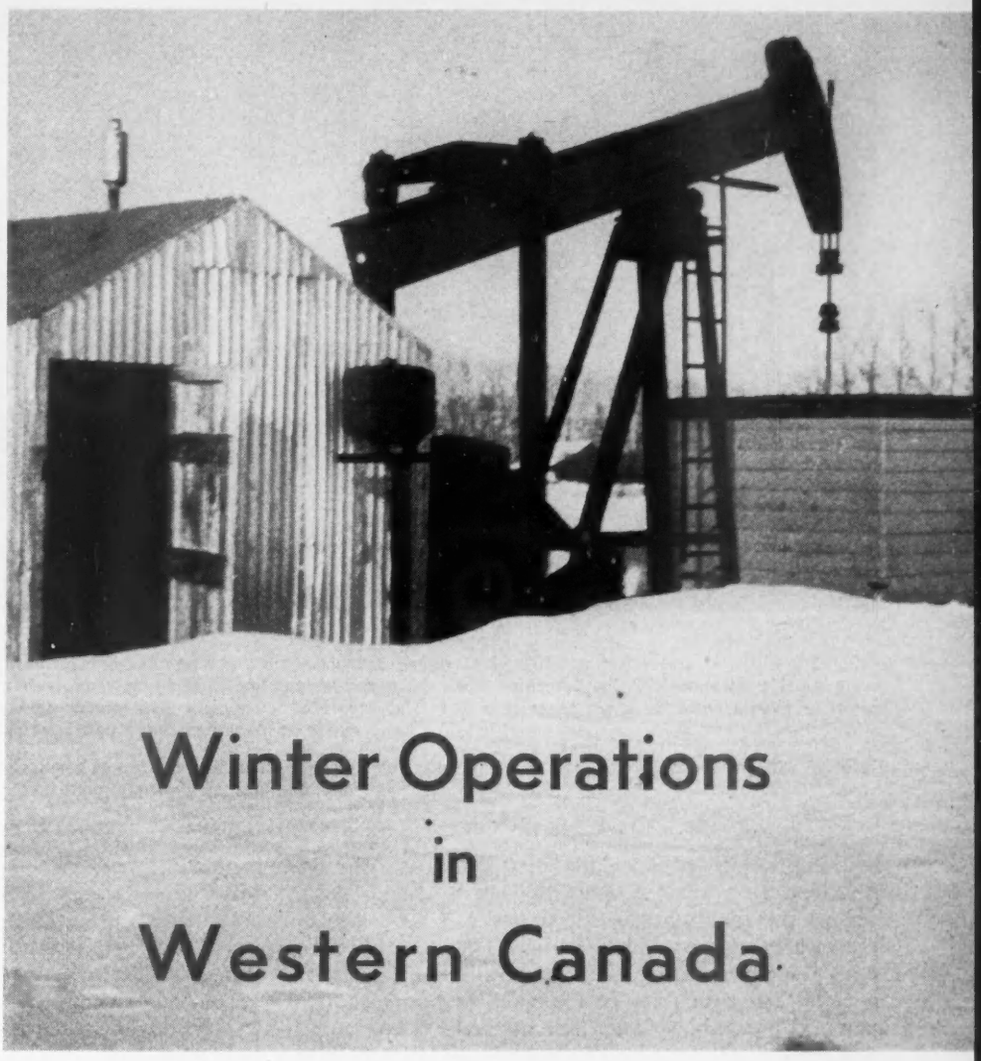


FIGURE 1. Common in Alberta fields is this boarded enclosure which surrounds the wellhead. This conserves natural heat of well fluid and protects exposed parts of the wellhead and lead lines. Unprotected, any emulsion being produced would freeze quickly and high paraffin content fluids would tend to clog lead lines quickly.

Winter Operations in Western Canada

By G. D. WRIGHT
Imperial Oil Limited

WESTERN CANADIAN oil producers are faced with a multitude of complex problems resulting from extremely cold temperatures which approach —60° F. While new methods are being tested constantly, present operating procedures leave much to be desired. This article outlines some of the actual well fluid production and attendant problems and the manner in which operators combat them. This paper was originally presented at the annual western meeting of the Canadian Institute of Mining and Metallurgy, October 3-5, 1951, Palliser Hotel, Calgary, Alberta.

SEVERE winters of Western Canada demand employment of specialized construction and operating technique to produce oil.

In this area temperatures below freezing occur during half the year. Extreme lows approaching —60 degrees must be anticipated. Cumulative depth of snowfall for oil producing areas exceeds four feet. Winds of gale proportions with driving snow produce blizzard conditions which pile the snow into drifts, rendering movement difficult and hazardous.

Under these conditions, Western Canada operators have been producing oil commercially for more than 35 years by gearing operations to cope with the climate.

It must be emphasized that producing oil is a continuing problem wherein new methods, new materials and new approaches are constantly evolving. Winter operation of oil fields in Western Canada requires that oil, gas and water must be produced, measured, transported, stored and disposed of under extremely difficult weather conditions. The low ambient temperature accelerates the rate of heat dissipation from well fluids. Since the cold air is constantly in motion at variable flow rates, the combined effect is a heat wiping action in which heat is literally "wiped away" from all exposed surfaces.

Under natural fluid flow conditions, the chilling effect of gas expansion normally increases the rate of paraffin deposition and the formation of hydrates and ice. This is universally encountered at many points in the flow stream such as wellheads, separators and downstream from areas of restricted flow such as proration chokes and various orifices. When these points are subjected to the independent cooling action of moving cold air, the problems become particularly acute.

Handling and disposal of oil field

Merry Christmas

SAND-BANUM

Pure Colloidal Concentrate

Removes and Prevents
Boiler Scale

Use Ounces Only
Once a Week

•

SAND-BANUM SPECIAL

The Concentrated
Colloidal Tablet
Removes and Prevents
Rust and Scale in
ALL Radiator Cooling
Systems

•

SAND-BANUM Products
Save You Money and
Help Keep Your Equipment
Merry All Year 'Round

•

Stocked By
Leading Supply Houses

•

Descriptive Literature On
Request

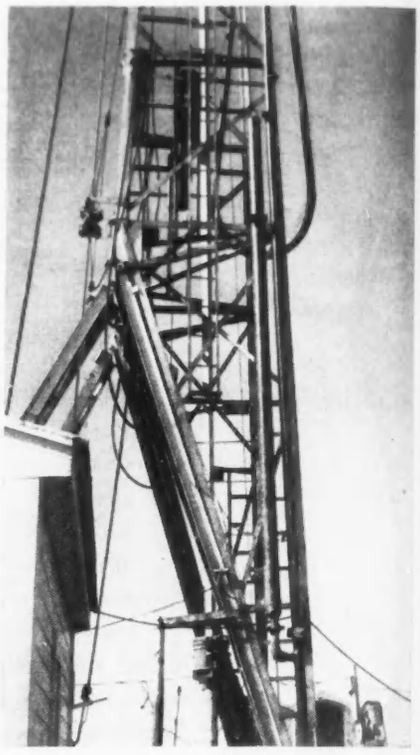
AMERICAN SAND-BANUM CO.
Established 1926
9 Rockefeller Plaza
New York 20, N.Y.

HOW TO—Reduce Surge in Mud Line

A permanent surge chamber mounted in the standpipe on the side of the derrick prevents mud hammer in the discharge line. This produces a steady pressure on the rotary hose and mud lines and increases the efficiency of the mud pumps. It also increases the life of the discharge valves since the pressure is leveled off and on the intake stroke there is no back hammer against the closed valves. It increases the life of the piston rubbers and packing glands due to the lowering of pressure surges.

A convenient place to mount the surge chamber is on the side of the rig. Once the chamber is connected it is not necessary to disconnect it when the rig is moved, as the standpipe, as well as the chamber, remains in place.

The surge chamber is constructed from two joints of seven-inch O.D. casing, with the upper end closed off with a bull plug. A bail welded into the bull plug is used in hoisting the vessel. The lower end is swaged down to four-inch, the size of the standpipe, and connected to the standpipe through an ell and a quick-acting union as shown. With the tip of the pipe closed, it remains full of air at all times and the surges of the mud pump are reduced.



HOW TO—Transfer Heavy Equipment

A dual purpose highline post is being used to load and unload heavy material from a transport truck. It is similar to a boom used on a truck with a winch line, except the side members are parallel and connected to each other at the top with a straight cross member.

Gusset plates are welded into the point of contact between the cross member and the side members to provide greater strength and insure adequate stability.

Like a truck boom, it is equipped with braces to adjust for the desired angle, and the bottom ends of all four posts are attached to the steel side rails of the pipe walk. Hinges are attached to the top ends of the braces at the contact between the ends and the highline parallel posts to provide movement when making the adjustment. Several holes are drilled in the side rails of the walk so the

CAN YOUR ROTARY HOSE BE REPAIRED?

GOODALL LONG-LIFE ROTARY HOSE... with the Built-in Barney Coupling *Gives You* DOUBLE SERVICE LIFE

Times like these especially . . . with steel and rubber on the critical list . . . test the maximum life of all types of equipment.

In the case of rotary hose, however, Goodall Rotary Hose owners have positive assurance that they will receive maximum life at all times . . . because Goodall is the only manufacturer that protects rotary hose investments with a time-proved maintenance policy. Goodall can offer this money-and-equipment saving policy because only Goodall Rotary Hose has the Barney Coupling, the first and only rotary hose coupling that can be reset to save your hose from the scrap heap.

That's why we say to all Goodall Rotary Hose owners: ***Never Discard a Goodall Rotary Hose until you contact us.*** And that's why we want to suggest to all rotary hose users: ***Why buy any other rotary hose that does not give you this Goodall combination of extra long life with extra protection for your investment?*** Thanks. Barney.

COUPLING—The original Barney Coupling is the only coupling that is stronger than the hose itself. It is the only coupling that can be reset to save your hose from the scrap heap.

CORD CONSTRUCTION—Goodall's flexible cord design provides the extra strength to withstand torsional twist . . . thus eliminating the cause of more than 90% of rotary hose failures.

FLEXIBILITY—Goodall Long-Life can be coiled into a convenient unit for transporting without slightest damage.

PERFECT BALANCE—The Goodall method of winding the multiple cords of the carcass and the steel cables of the pressure element at corresponding angles assures perfect balance.

GREATER STRENGTH—By actual test, Goodall Long-Life is the strongest hose ever built and it retains its strength better than any other hose.

REPAIR SERVICE—Goodall Rubber Company is the only rotary hose manufacturer that can protect your investment with a maintenance plan. Goodall maintenance provides a repair department in Houston where any length of Long-Life that meets with an accident can be renewed for the rest of its normal life. No length of Long-Life repaired in our shop has ever failed in service.

SALVAGE VALUE—Substantial allowances are made on every set of Barney couplings returned.

NO PREMIUM PRICE—The extra quality, longlife and high salvage value of Goodall Flexible Cord costs no more than ordinary rotary hose.

GOODALL RUBBER COMPANY
TRENTON, N. J.

GOODALL RUBBER COMPANY OF TEXAS: Houston, Texas.
GOODALL RUBBER COMPANY OF CALIFORNIA: San Francisco, Los Angeles, Seattle, Salt Lake City, Portland.
GOODALL RUBBER COMPANY: New York, Philadelphia, Pittsburgh, Chicago, Denver, St. Paul, Detroit.
EXPORT: Goodall Rubber Company, Trenton, N. J.
DISTRIBUTORS: Texas and Louisiana — Houston Oil Field Material Co.; Wilson Supply Co.
Oklahoma — Iverson Supply Co.

GOODALL HAS BEEN **FIRST** WITH EVERY WORTHWHILE ROTARY HOSE DEVELOPMENT

SIMPLIFY tough PULLING jobs!

Pull Rod or Screw Is Inserted through UNIQUE "CENTER-HOLE"*
Ram plunger and is drawn in a straight, torque-free pull through Ram. Ram is its own back up! Less rigging time—more effective power!
10 to 100 ton capacities.
*"Center-Hole" in Rams of 30-ton and greater capacities.

SIMPLEX Re-Mo-Trol HYDRAULIC PULLERS

PUMPS AND REMOTE CONTROLLED RAMS

If it can be pulled, Re-Mo-Trol can pull it—easier and faster! Pulls liners, sleeves, shafts, gears, etc. SAFER remote control. Also lifts or presses. Can save its cost on a single tough job!

Simplex Jacks

WRITE FOR BULLETIN: HYDRAULIC 51

TEMPLETON, KENLY & CO.

1032 So. Central Ave., Chicago 44, Illinois

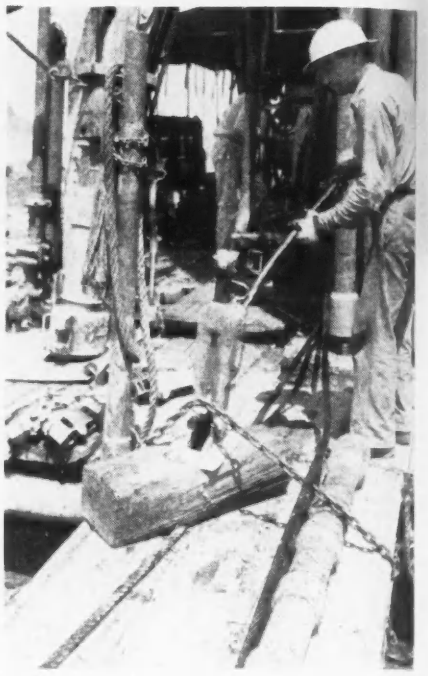
DRILLING HINTS

HOW TO—Keep Line Tight on Spool

A simplex jack, a piece of chain and a block of wood are the only equipment necessary to keep the derrick line taut while it is being spooled back on the drum after it has been removed for replacement or repair. It is essential that the line be tight to prevent it from "swarming" when the weight of the drill pipe is placed on it.

After the end of the line is fastened securely on the drum, the block of wood is laid on the derrick line and the jack set on top of the block. A short length of chain is then thrown under the floor of the walk and the ends are hooked together over the jack. It is then easy for the crewman to take a strain on the chain and hold a friction grip on the derrick line to make it spool tightly.

As the line is drawn through the space under the block, it gradually cuts into the wood, but another notch can easily be taken in the jack.



SLUSH PUMP LINERS RE-BORED

TO ANY STANDARD SIZE
— WE DO THE JOB —
— RIGHT! —

NEW LINER GUARANTEE
65%
OF NEW LINER COST

Our Representative Will Be Glad to Call
Write to

WICHITA TOOL REPAIR CO.
104 Oak, P. O. Box 511
WICHITA FALLS, TEXAS

PEAK PERFORMANCE . . . LONGER!

For over 20 years drilling and pumping operators have had less "shut down time" with STITT "X" (sour gas) type spark plugs. Buy proven STITT "X" (sour gas) plugs, as well as regular plugs, at your supply store.

STITT spark plugs

MANUFACTURED BY
STITT IGNITION COMPANY, COLUMBUS, OHIO

Production Section

J. E. KASTROP, SECTION EDITOR

WORLD OIL

TRET-O-LITE

TO HELP YOU PRODUCE PIPE-LINE OIL AT THE LOWEST POSSIBLE COST

1. A complete line of proved TRET-O-LITE dehydrating reagents, designed to correct your emulsion problems, economically.

2. The effective KONTOL Corrosion Inhibitors, in both liquid and stick form, designed to prevent the corrosion of sub-surface and other production equipment.

3. The TRET-O-LITE reagents designed to mitigate oil-in-water problems,—effective stream pollution preventives and sources of savings in salvaged oil.

4. The TRET-O-LITE Scale Preventives, especially developed to prevent production difficulties encountered when hard-water scales are a problem.

5. The SOLVO, PARASOL or PARID paraffin reagents, with solvent and detergent properties, are often economical answers to an annoying paraffin problem.

6. A large staff of trained treating service engineers, located in or near every oil field, always ready to advise and assist you with your production problems.

TRETOLITE COMPANY

Chemicals for the Petroleum Industry

SAINT LOUIS 19, MISSOURI — LOS ANGELES 22, CALIFORNIA

TC 51-3

DEHYDRATING • DESALTING • CORROSION INHIBITION • SCALE PREVENTION • WATER DE-OILING • PARAFFIN REMOVAL

HERE'S

Yuletide Greetings

FOR YOU AND YOURS . . . . .

From 22 Bovaird Offices and Stores

THE **Bovaird** SUPPLY COMPANY

GENERAL OFFICES
TULSA, OKLAHOMA

80 YEARS OF PROGRESS WITH THE OIL INDUSTRY

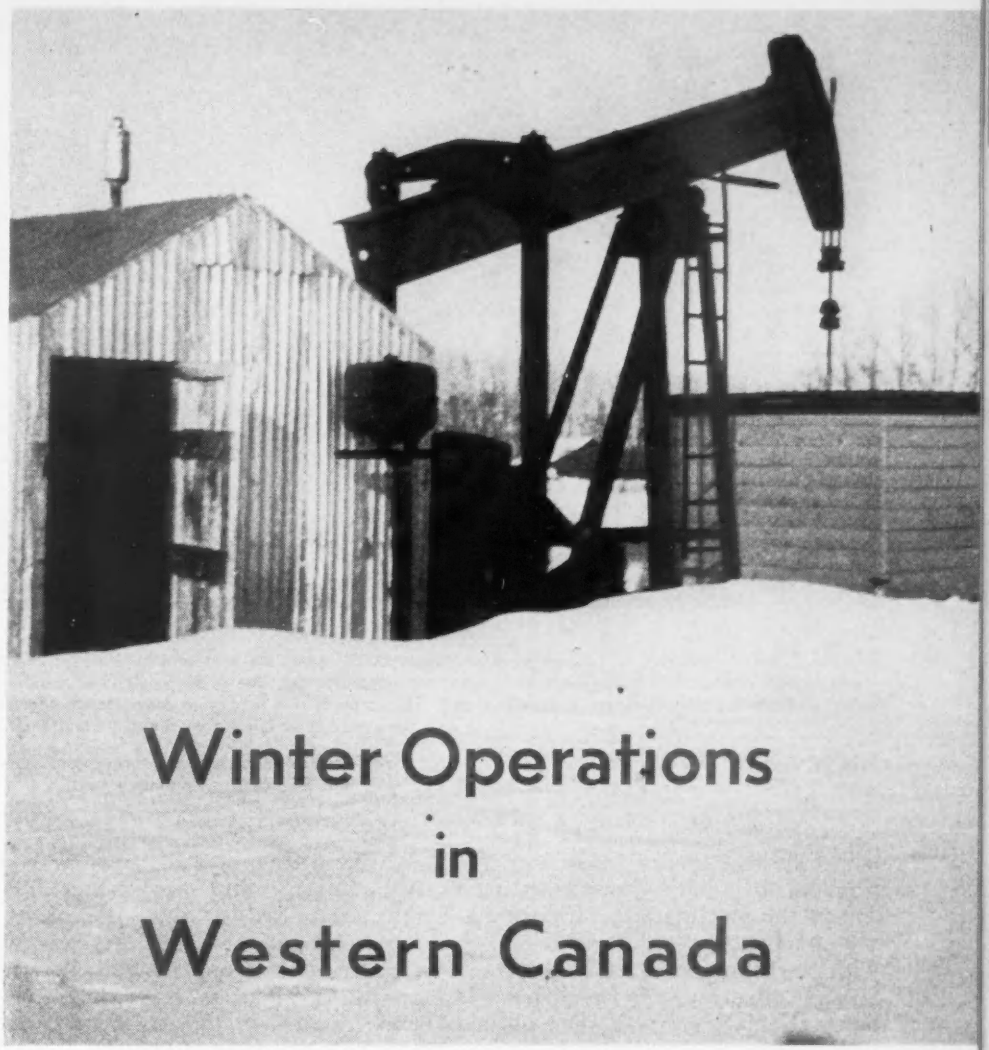


FIGURE 1. Common in Alberta fields is this boarded enclosure which surrounds the wellhead. This conserves natural heat of well fluid and protects exposed parts of the wellhead and lead lines. Unprotected, any emulsion being produced would freeze quickly and high paraffin content fluids would tend to clog lead lines quickly.

Winter Operations in Western Canada

By G. D. WRIGHT
Imperial Oil Limited

WESTERN CANADIAN oil producers are faced with a multitude of complex problems resulting from extremely cold temperatures which approach —60° F. While new methods are being tested constantly, present operating procedures leave much to be desired. This article outlines some of the actual well fluid production and attendant problems and the manner in which operators combat them. This paper was originally presented at the annual western meeting of the Canadian Institute of Mining and Metallurgy, October 3-5, 1951, Palliser Hotel, Calgary, Alberta.

SEVERE winters of Western Canada demand employment of specialized construction and operating technique to produce oil.

In this area temperatures below freezing occur during half the year. Extreme lows approaching —60 degrees must be anticipated. Cumulative depth of snowfall for oil producing areas exceeds four feet. Winds of gale proportions with driving snow produce blizzard conditions which pile the snow into drifts, rendering movement difficult and hazardous.

Under these conditions, Western Canada operators have been producing oil commercially for more than 35 years by gearing operations to cope with the climate.

It must be emphasized that producing oil is a continuing problem wherein new methods, new materials and new approaches are constantly evolving. Winter operation of oil fields in Western Canada requires that oil, gas and water must be produced, measured, transported, stored and disposed of under extremely difficult weather conditions. The low ambient temperature accelerates the rate of heat dissipation from well fluids. Since the cold air is constantly in motion at variable flow rates, the combined effect is a heat wiping action in which heat is literally "wiped away" from all exposed surfaces.

Under natural fluid flow conditions, the chilling effect of gas expansion normally increases the rate of paraffin deposition and the formation of hydrates and ice. This is universally encountered at many points in the flow stream such as wellheads, separators and downstream from areas of restricted flow such as proration chokes and various orifices. When these points are subjected to the independent cooling action of moving cold air, the problems become particularly acute.

Handling and disposal of oil field

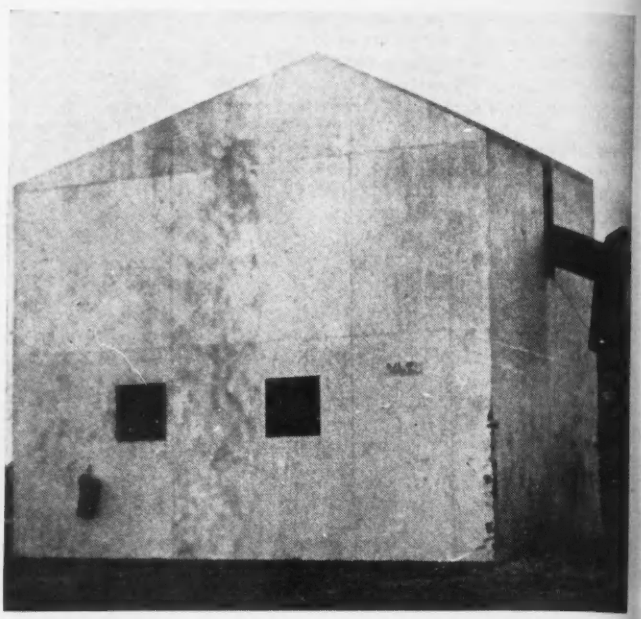


FIGURE 2 (left). Hydrates and paraffin which freeze and accumulate in separator lines often must be thawed out after a particularly severe cold spell. At this installation in the Edmonton area, the separator gas line is being steamed. Steam generally is obtained from either a battery heating boiler or from a portable steam generating unit. This separator is equipped with steam heating coil, the one-inch incoming and outgoing lines being visible at lower right hand part of shell.

FIGURE 3 (right). View of enclosed pumping unit. Heat emanating from the internal combustion engine is conserved and used to heat lubricants and bearings of pumping unit.

brines present an especially intricate problem. In addition, operators must accept the fact that the efficiency of personnel working outside decreases with the temperature. It is generally accepted that men can be expected to perform only about half their normal work output during severe cold.

Conception of the "wind chill factor," which recognizes the compounding effect of wind velocity on temperature effects, is useful in this regard. It is necessary to visualize a similar concept as applicable to equipment and oil field fluids. Result of the acceptance of this thought is realization that operating data obtained under actual winter field conditions tend to be more useful than those obtained in laboratory refrigeration tests.

Recognition of the effects of extreme cold must start with plans for all permanent structures. Foundations are designed to extend below frost level to eliminate the possibility of frost heaving the structures. Operators have learned that concrete can be poured under relatively severe winter conditions, providing the constituents are preheated and heat carefully conserved.

Well Fluid Heat Retained

Considering actual well fluid production problems, the program for conserving natural heat and decreasing the rate of heat transmission to the surroundings frequently starts at the wellhead. These may be insulated or otherwise protected, one method being as shown in Figure 1. Most flow lines are buried for protection.

Battery equipment such as separators, treaters, tanks and other units are frequently insulated or shielded in some manner to lessen the severity of the heat wiping effect.

In many areas operating conditions are such that insulation and protection cannot conserve enough heat to prevent paraffin deposition, or the formation of ice and hydrates in lines and vessels. Frequently, provision is made for adding heat. Boilers or other heating units may be installed and steam or hot fluids circulated to critical points. Lines are often traced with steam lines, and heating coils installed in separators (Figure 2) and other vessels. Orifice meters and proration choke manifolds are frequently enclosed and heating elements installed.

It is evident that where heat is supplied in sufficient quantity, almost any equipment may be used and any operation carried out. This approach amounts to providing an "artificial environment" in which the oil field exploitation program may progress.

The almost completely enclosed pumping unit shown in Figure 3 indicates an extension of the artificial climate technique to pumping equipment. The heat emanating from the internal combustion prime mover is conserved and used to heat the lubricant and bearings of the remainder of the unit.

Operators have realized that such installations, in common with battery heating boilers, represent a capital investment that may become prohibitive as well as causing very heavy operating expenses for maintenance, repairs and labor, though they effect a reduction in cold weather difficulties.

Faced with this uneconomic situation, operators have developed numerous alternative programs to provide continuous efficient operating conditions and reduce capital investment and overhead.

Some operators have designed batteries with no provision for heating. When cold weather has stopped operation of these installations, portable heating equipment may be moved in to remove the accumulations of paraffin, hydrates and ice or to raise the crude temperature to produce pumpable viscosities.

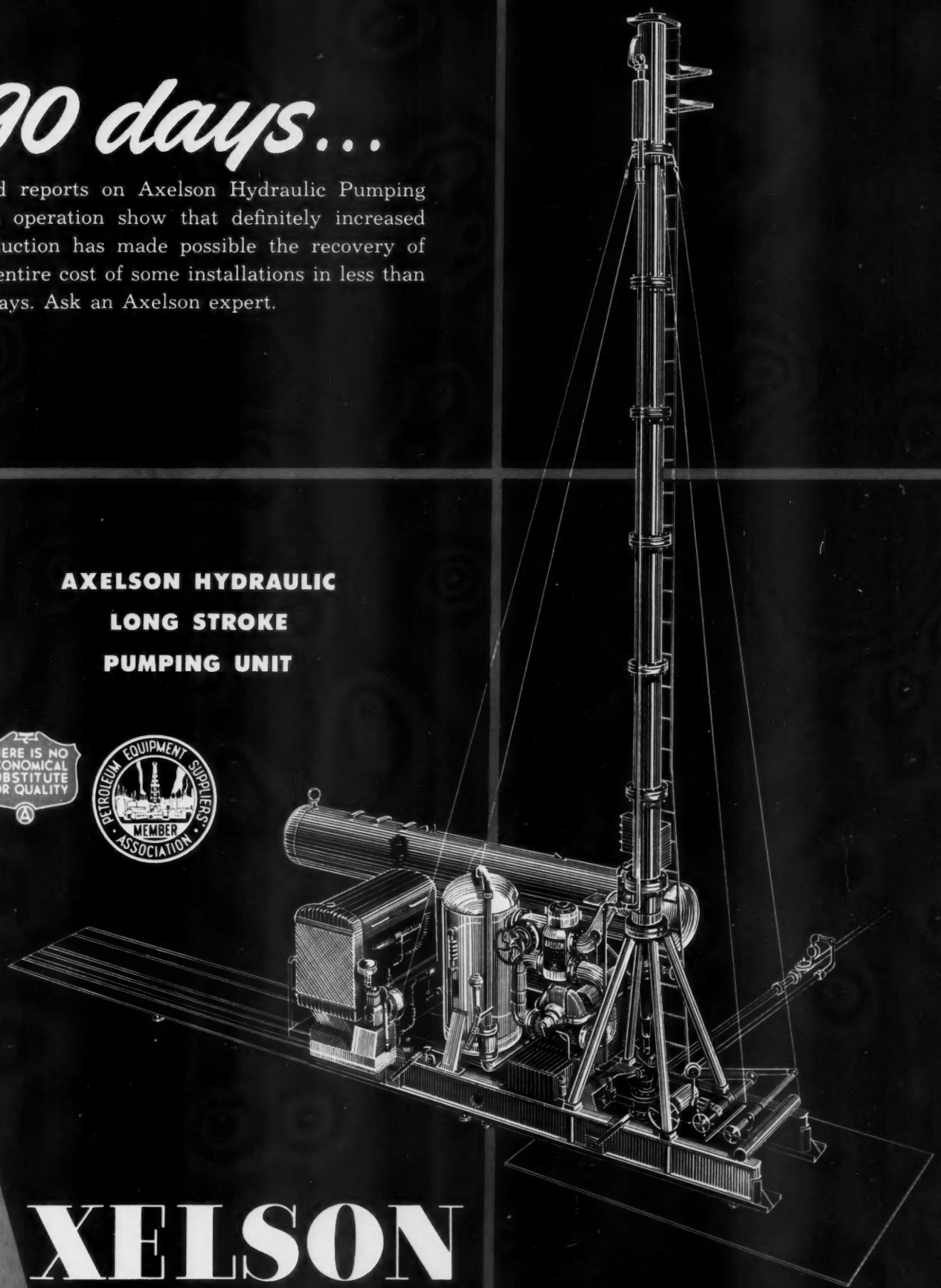
Batteries without heating units are feasible where low pour point crude is produced under gas-oil ratio conditions and where measurement of gas is not required. Areas operating with higher gas-oil ratios are usually required to account for produced gas. Measurement of gas becomes particularly difficult in winter weather since rapidly forming paraffin, ice and hydrates at the orifice render meter readings inaccurate. Mercury manometers on orifice meters present a unique problem, since mercury freezes at approximately —38 degrees.

Under such conditions, some form

90 days...

Field reports on Axelson Hydraulic Pumping Unit operation show that definitely increased production has made possible the recovery of the entire cost of some installations in less than 90 days. Ask an Axelson expert.

AXELSON HYDRAULIC
LONG STROKE
PUMPING UNIT



THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

PETROLEUM EQUIPMENT SUPPLIERS' ASSOCIATION MEMBER

AXELSON

First Choice

AXELSON MANUFACTURING CO. • PLANTS—Los Angeles 58; St. Louis 16 • OFFICES—New York City 7; Tulsa 1; Buenos Aires, Argentina; Caracas, Venezuela • DISTRIBUTORS—Jones & Laughlin Supply Co.; Great Northern Tool & Supply Co.; Industrial Agencies, Ltd., San Fernando, Trinidad, B.W.I.; Industrias Waldrip & Campbell, Barcelona & Maracaibo, Venezuela; Dominion Oil Field Supply Co., Ltd., Calgary, Canada; South American Supply Co., Avenida Tacna 592, Lima, Peru.

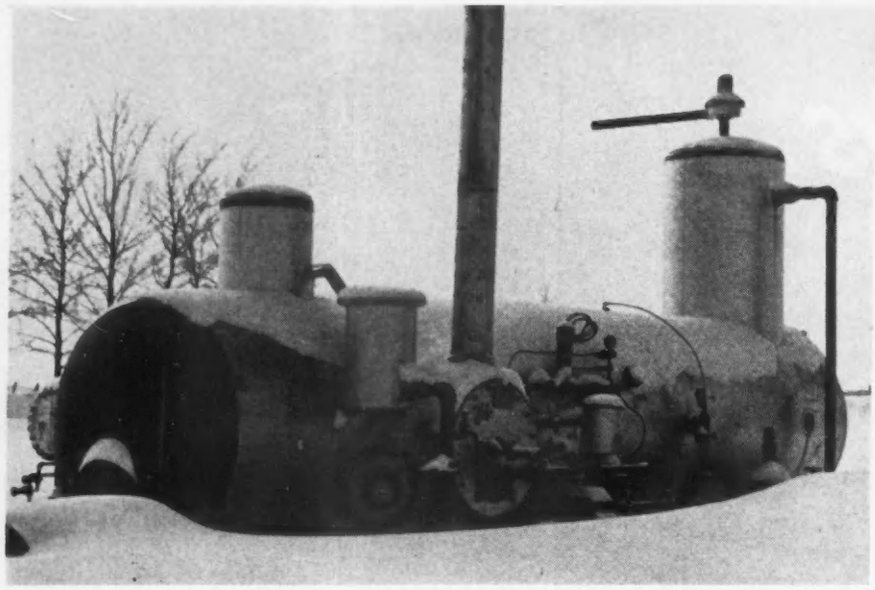


FIGURE 4. Sub-zero temperatures, combined with the chilling effect of cold winds, often render an unprotected treater, such as that shown above, useless for oil heating or treating.

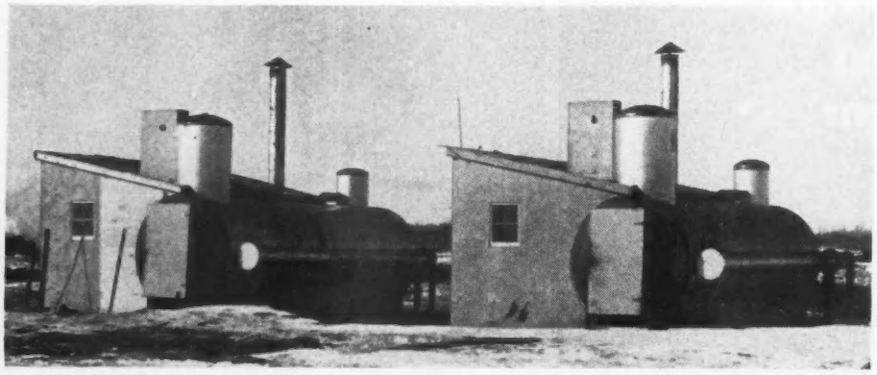


FIGURE 5. Small lean-to structures often are built to partly protect the critical points in the controls and piping of the treater units. In this intsallation some of the outside piping is enclosed in the leanto. Tall wooden enclosures at ends of the treaters house glass sight gauges.

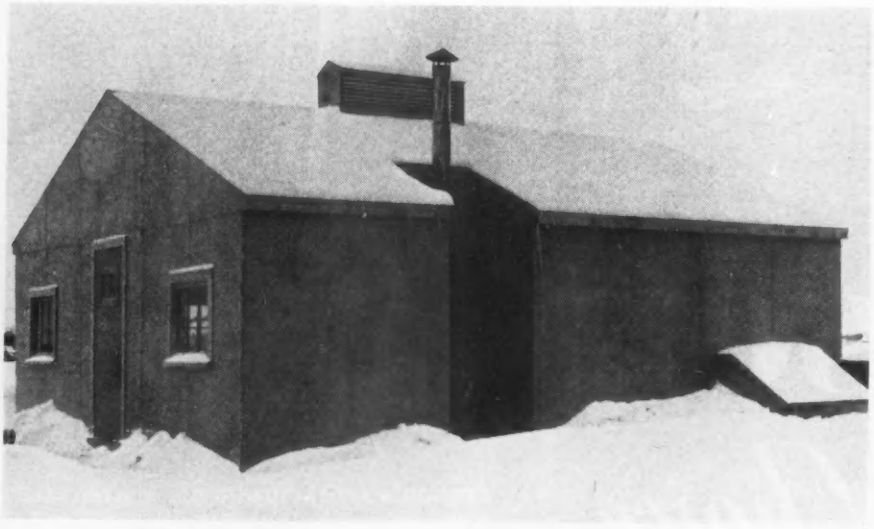


FIGURE 6. View of a more elaborate house built around a treater unit. Such a building, generally made of insulated panels, can house not only the treater, but gas meter runs, circulating pumps, desk space and, in some instances, even garage space for an automobile.

of battery heating can hardly be avoided. Installation of a heated emulsion treater provides a heat solution in many cases, since the hot fluids thus made available may be directed to critical points in the battery hookup. Many operators have adopted the policy of installing a treater prior to the time that water may be produced to make available the heated treater fluids for battery heating. Present treaters offered the industry require some form of protection to ensure operation of the units and auxiliary equipment.

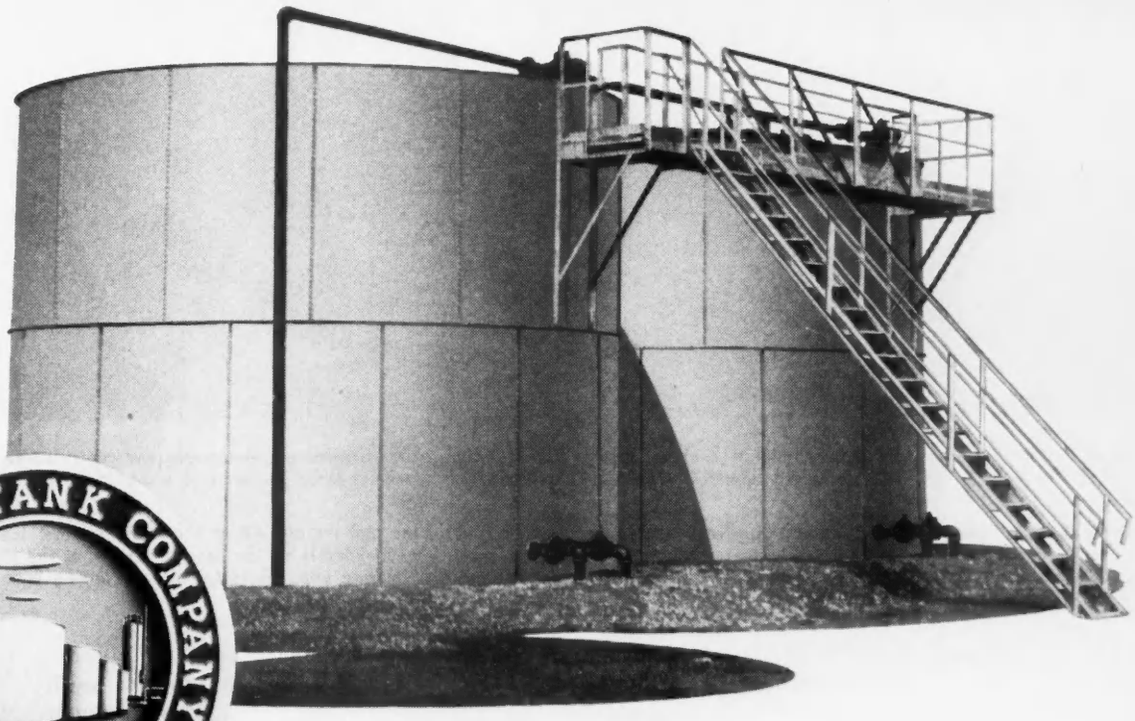
Figure 4 indicates the possible result when no protection is furnished. The unit has been allowed to stand in subzero weather and is completely useless for oil treating or heating. Operators install enclosures of varying design from small lean-to structures, such as those shown in Figure 5, to elaborate buildings housing the entire treater and auxiliary equipment with the exception of the exposed portions of the firetube. In such a building as shown in Figure 6 gas meter runs, circulating pumps, battery office space, and even garage space may be provided, all heated by the heat radiating from the treater shell surface. Figure 7 is an interior view of a completely enclosed horizontal treater installation.

Metals Affected by Cold

Since the impact strength of steels decreases sharply with decreasing temperatures, another problem is added for the operators' consideration. Eventually it may be found necessary to design metal units and specify metals for this limiting factor where impact strength is critical. Since grain size and distribution, in addition to actual components and heat treatment, are significant in determining the impact strength of a steel, specifications for cold weather service would necessarily be complex. Considering metals behavior further, field welding in cold weather presents its own problem since rapid cooling of the weld area caused by a high temperature differential affects the grain size and composition with significant effects on the strength of the weld.

Turning to lubrication problems, it is fairly common practice to change lubricants in both spring and fall to provide properly selected summer and winter grade lubricants.

The pumping unit saddle-bearing assembly, with broken cap and lubricant escaping, shown in Figure 8, exemplifies an effect of cold weather on lubricants and metals. Since all the heavy summer lubricant could not be removed from the bearing surface of



NATIONAL TANK COMPANY
1926 • 25 YEARS OF SERVICE • 1951

National Tanks
are petroleum banks!

Thousands of trouble-free deposits and withdrawals of petroleum products are made where National Tanks are used.

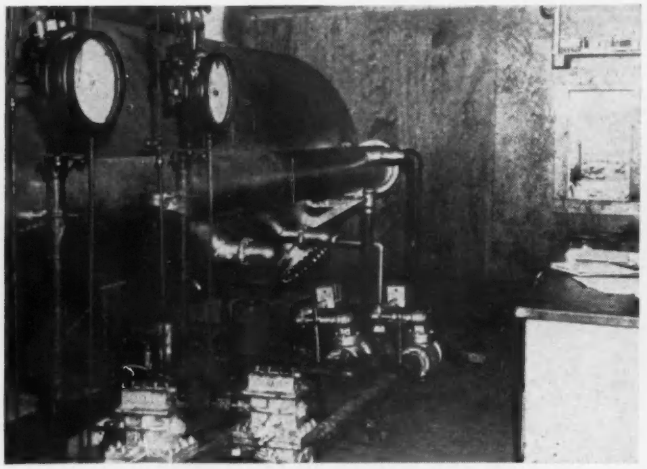
Rugged, dependable National equipment is engineer-designed, field proven and manufactured with the most modern methods and plant equipment. National's assembly line operates on the automotive principle.

When your oil operations require storage tanks, separators, heaters, treaters, dehydrators—or any other equipment produced by National—remember, National equipment is in service throughout the oil world.

It's a National

NATIONAL TANK COMPANY

TULSA, OKLAHOMA



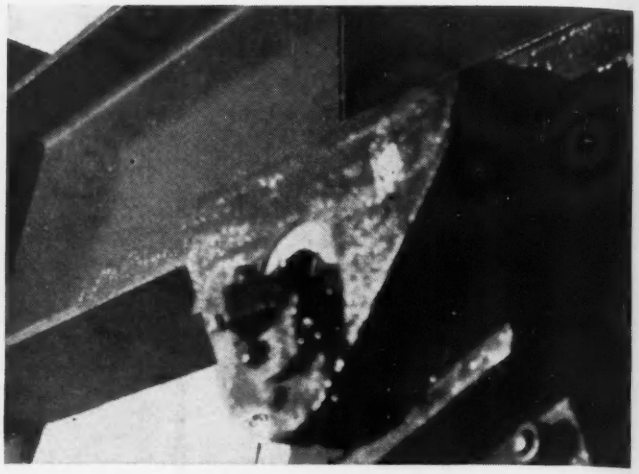


FIGURE 7 (left). Interior view of a completely enclosed treater unit showing arrangement of gas meter runs and controls which are heated by the heat radiating from the treater shell surface. Desk space for lease pumper also is provided.

FIGURE 8 (right). Shown here is one of the effects of cold weather upon lubricants and metals. All of the heavy summer lubricant could not be removed and it congealed in cold weather, preventing the shaft from moving independently on the bearing surface of the bronze bushing. When the unit started up on time clock, the resultant shock fractured the cast iron bearing cap, the latter already having been rendered brittle by the extreme cold.

the bronze bushing, it congealed in cold weather and prevented the shaft from moving independently when the unit started on time clock. The resultant shock transmitted to the cast iron bearing cap, which had been rendered brittle by cold, was sufficient to fracture it.

Year-Round Lubricant Needed

In an effort to reduce the high cost of bi-annual lubricant changes, many operators are experimenting with wide temperature range lubricants having pour points sufficiently low to ensure lubrication in cold weather while still retaining adequate lubricating properties for summer operation.

The various new silicone-base lubricants which show little viscosity variation with temperature changes may help to solve the problem. To obtain winter operating data, field tests of silicone greases in electric motor bearings are presently under way.

It appears that the types of oil and grease seals presently installed may require revision should success follow the preceding lubricant experiments.

In a radical approach to the problem aimed at eliminating lubrication problems completely, some operators are experimenting with graphite-impregnated bushings replacing oil bath lubricated bronze bushings.

All equipment embodying synthetic rubber elements presents a special problem in cold weather. The rubber currently employed becomes brittle and shatters readily so that the equipment must be protected from cold. Since synthetics of this type are producible with wide variation in properties, operators feel that solution of this problem is possible in the near future.

Higher-Torque Motors Required

An example of the effect of cold weather considerations on selection of equipment may be of interest. Since cold extremes impose a greatly increased bearing friction and lubricant viscosity load on the electric motor powering a pumping unit, a motor must be specified having a higher horsepower rating than would normally be required. In addition, the motor selected must have ample builtin starting torque to guarantee immediate response even under the most adverse temperature conditions.

Since the search for oil is rapidly progressing farther north into areas of even more extreme winter conditions than those encountered to date, the problems of winter oil field operation will become increasingly more difficult.

Operation in perma-frost areas, where permanently frozen ground underlies the surface at a short distance, eventually will become an accepted procedure. Further drastic revision of operating methods and equipment will be required to meet the special problems to be encountered in these areas.

Operators have evolved workable systems to guarantee the continuous flow of Western Canada's oil and gas uninterrupted by climatic extremes. Production of this increasingly important oil and gas from the present areas, and that which undoubtedly will be developed in areas even still farther north, may become an important factor in the defense of the western world. Most operators in this region are modifying or improving equipment designed for warmer climates. They feel, however, that concentrated research and investigation will help to develop materials, lubricants and equipment better suited for cold weather, and are looking to manufacturers and designers to attack the problem to assure efficient and uninterrupted operations in this region.

About the Author

G. D. WRIGHT was born in Calgary and educated at the University of Alberta and Colorado School of Mines. He worked for McColl-Frontenac Oil Company, Ltd., the company then operating in Canada for The Texas Company, from 1939 to 1947, supervising drilling and producing operations. He has been with Imperial Oil Limited since 1947, first as drilling engineer, then as Leduc district petroleum engineer. In the latter part of 1950, he was transferred to Calgary as division equipment engineer, the position he now holds.

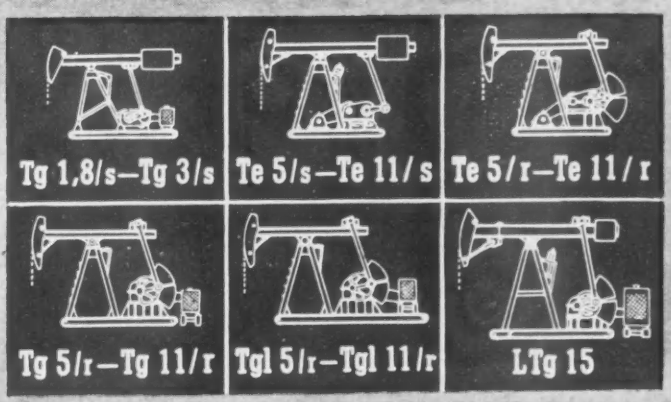
Increased Production Higher Efficiency

by using **Wülfel**

OILFIELD EQUIPMENT

Individual Pumping Units with Beam or Crank Counterbalance.

Long stroke lengths increase the service life of pumps and sucker rods and reduce the frequency of pump changes.

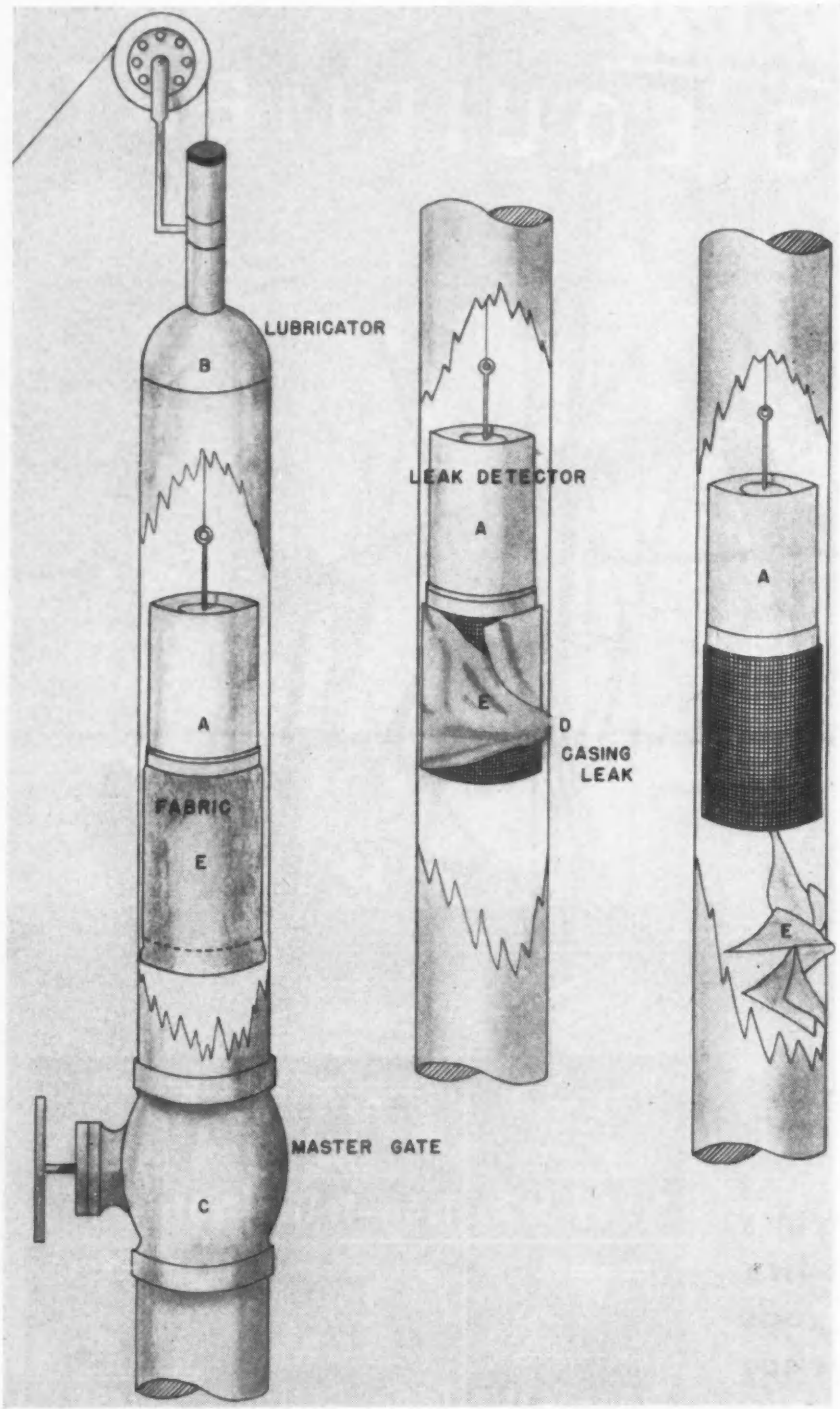


Quick, secure and exact adjustment ensures easy adaptation to the varying well conditions.

EISENWERK WUELFEL · HANNOVER-WUELFEL (GERMANY)

Gas Well Casing Leak Detector

By JOSEPH C. RICHARDSON, JR.
The Shamrock Oil and Gas Corporation
Amarillo, Texas



THE LEAK DETECTOR is placed in a lubricator which in turn is mounted on the master gate. The master gate is then opened and the detector lowered on a wire measured line. Upon reaching the gas leak the fabric is pulled into the leak from the detector. This action stops the descent of the device at which time the depth may be noted. The detector is then withdrawn, leaving the fabric as a temporary seal of the leak. A new fabric is attached and the same procedure followed as mentioned before except that now the detector may be lowered past the first leak without difficulty to test for other possible casing leaks.

A NOVEL device which features simplicity in construction and operation is being used with marked success in the Panhandle area, Texas, to detect leaks in gas well casing strings. This device has been applied to 46 gas wells and it is estimated that a saving of $240,000 has been effected in casing, cement, tools and labor, while over-all gas saved is estimated at about 44 million cubic feet per day.

The casing leak detector has been used primarily in strings which have developed leaks due to electrolytic action resulting in corrosion and pitting. This type of corrosion has been noted in the Texas Panhandle to occur usually within casing strings opposite the upper producing horizons. It has been a source of serious gas waste as well as an economic loss to operators.

The leak detecting device consists primarily of a vertical metal cylinder approximately 17 inches long with a wire mesh cylinder attached to the lower end and over which is placed a fabric skirt secured in place by heavy rubber bands. A steel measuring line is attached to the upper end of the cylinder for lowering into the well.

In operation the casing leak detector is simply lubricated into the hole and then lowered by means of the measuring line. When the device reaches the leak in the casing the pressure differential between the casing and the annulus pulls the cloth skirt from the detector into the leak, thereby temporarily sealing the escaping gas. This sealing action also stops the descent of the detector and the depth of the leak, within a foot, can be read from the measuring device at the surface.

Once the leak has been located within the pipe the detector is withdrawn, leaving the skirt in the leak.

At the surface a new skirt is attached to the detector and the device is again lowered into the casing to locate additional leaks. As the detector is lowered through the producing string no difficulty is experienced in passing on down since the first skirt has temporarily sealed the upper leak.

With the depth of the leak or leaks accurately determined, a smaller diameter string of casing is set to a point below the lowest leak, using a packer. This will effectively seal all leaks in the original producing string, and since the new producing string is not set to the bottom of the hole, but only to a point just below the lowest leak, an appreciable saving in steel pipe is effected.

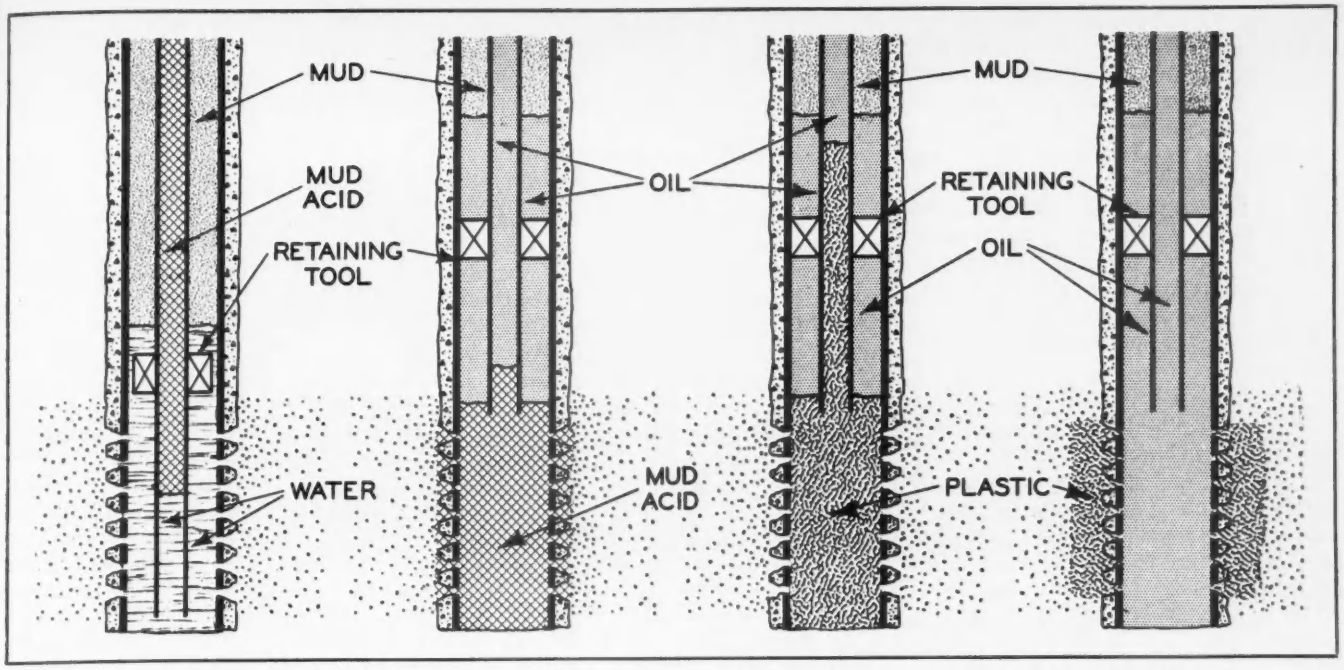


Diagram of steps involved in new sand consolidating treatment, wherein acid is used ahead of the plastic material.

New Techniques for Application of Plastics In Consolidating Formations

By H. B. RITCH and P. H. CARDWELL
Dowell Incorporated

A TECHNIQUE has been developed for applying plastics in consolidating incompetent formations. The procedure is to use mud acid ahead of the plastic to remove the mud cake from the walls of the formation. The mud acid will also dissolve the silicates from the immediate vicinity of the well bore. This enables the plastic to penetrate the formation better and to make closer contact with the sand grains.

In the application of the plastic it has been found advisable to displace the plastic out of the well bore and out of the perforations as completely as possible. This procedure differs from a number of the original sand consolidation treatments with plastic in which it was the practice to leave the plastic over the perforated interval of the casing. Results are given for the most recent 37 sand consolidation treatments as well as laboratory data on the use of mud acid.

Plastics have been used for a number of years for consolidating incompetent formations.[1,2] Such formations present a serious problem in the production of oil and gas from the standpoint of sloughing of the formations which results in "sanding up" of wells. Plastics bond the sand grains together and at the same time leave permeability within the formation for the production of oil and gas.

LATEST TECHNIQUES for performing sand consolidation treatments are described, and results on 37 actual cases are presented. The authors discuss a new method of consolidating sands wherein the formation is first treated with an acid to dissolve clays which may plug up the pore spaces. The value of this acid treatment is shown in tabular form where different formations in Louisiana, Arkansas, Mississippi and Texas have been treated.

Since the introduction of plastics for this purpose, a number of procedures have been used to apply the plastics to the well. Some of the methods have met with good success, whereas others have not been too satisfactory. At present the technique for performing sand consolidation treatments has been more or less standardized, the only exceptions being minor changes in each treatment to meet specific conditions of individual wells.

Chemical Materials

Chemicals used to perform a sand consolidation treatment are mud acid and the consolidating plastics. Purpose of the mud acid is to remove mud cake which may be on the walls of the formation and in general to

"clean up" the bottom of the hole as well as the formation. By removing the drilling mud, the mud cake, and the clay materials from the formation, the plastic can penetrate more uniformly into the formation and can better bond together the sand grains. This latter step is accomplished by dissolving the silicates or silt-like materials within the formation and drilling mud that may have infiltered. Removal of these materials brings about a better contact between the sand and the plastic.

The acid used is a mixture of hydrochloric and hydrofluoric acids containing the necessary inhibitors, wetting agents, and emulsion-preventing materials. Such a solution will dissolve clays of the montmorillonite, illite and kaolinite types to form acid soluble fluosilicates.

Value of the mud acid can be seen from Table 1. The results given in this table were obtained by consolidating in the laboratory a series of actual oil well sand samples. The consolidation was carried out by two procedures. One method was to treat with plastic the sand in the condition in which it was received; the other was to treat the sand first with mud acid and then with the plastic. It will be noted in the table that the acid-treated consolidated sands have considerably higher permeabilities than the corresponding untreated consolidated sands.

Choosing A Plastic

Since the object in a treatment of this type is to cement the sand grains and at the same time leave permeability throughout the sand, the most desirable plastic to use will depend, among other things, upon the strength of the consolidation desired and the size of the sand grains.

A property of the sand consolidation plastic, which is a liquid, is that its volume is considerably greater than the volume of the solid formed therefrom when the plastic sets. This decrease in volume from that of the liquid to that of the solid, brings about the permeability within the sand. The solid which is formed cements the sand particles together. The more solid the plastic cementing material used, the stronger is the consolidation. Likewise, the more cementing material used, the greater is the reduction in permeability. Thus, a more or less "happy medium" has to be decided upon between the amount of consolidation and the resulting permeability of the consolidated formation.

For this reason, with very fine sands, only a relatively small amount of solid plastic is formed from the liquid and similarly, for large sand particles a greater amount of solid plastic is required per volume of sand. The amount of solid plastic required to cement the sand grains is formed from a volume of liquid sufficient to fill the pore space of the sand. The net result of this is that for the fine sands the consolidation plastic has a large ratio of liquid volume to set solid volume; and for coarse sands a small ratio of liquid volume to set solid volume. By the control of the ratio of the liquid volume of the plastic to set solid volume, it is possible to consolidate various size sands. This control is accomplished in the manufacture of the plastic. Since a number of incompetent formations have about the same size sand grains, it has been possible to standardize on one plastic for a number of the formations.

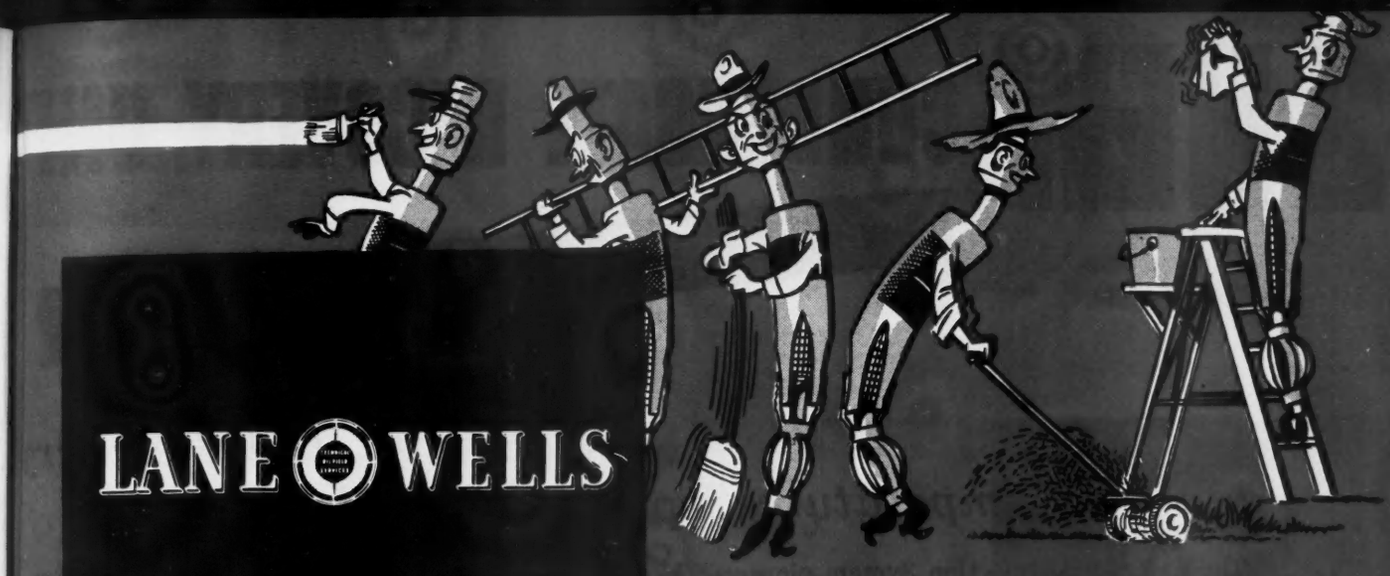
Table 2 gives the results of consolidating different size sands with various plastics. The permeability of the consolidated sand depends, among other things, upon the type of plastic used; that is, the ratio of the liquid

TABLE 1
Value of Mud Acid Treatment Prior to Sand Consolidation

Formation, Field, Location	SAND SIZE ANALYSIS (Percentage)—U.S. Standard Sieves							Water Permeability (Darcys) Before Consolidation		Percent Mud Acid Solubility	Water Permeability (Darcys) After Consolidation		Consolidation Plastic Liquid Volume Ratio to Volume of Set Solid
	On 40	40–60	60–80	80–100	100–140	140–200	Through 200	As Received	After Mud Acid Treatment		As Received	After Mud Acid Treatment	
Miocene, Hackberry, La.	6.7	47.3	24.8	9.2	6.4	2.1	3.5	....	29.0	14	2.0	2.3	1.7:1
Miocene, Moss Lake, La.	2.1	12.1	21.6	22.4	27.9	8.2	5.7	2.73	3.11	26	0.62	0.73	2.0:1
Nacatoch, Stephens-Smart, Ark.	0.7	34.1	43.3	12.5	7.4	0.9	1.1	....	31.8	33.5	2.0	2.9	2.0:1
Miocene, Hackberry, La.	0.5	2.4	14.1	25.3	29.6	8.4	19.7	7.7	9.02	32	1.5	2.0	2.0:1
Miocene, Gibson, La.	..	0.2	0.3	2.7	39.4	27.8	29.6	4.53	4.96	23	0.39	0.46	2.0:1
Oligocene, Cankton, La.	2.0	6.1	36.1	44.1	4.0	3.5	4.2	9.0	12.8	9	4.6	5.7	2.5:1
Miocene, S. Jeanerette, La.	0.4	2.7	28.3	33.0	24.0	4.0	7.6	2.5	10.5	14	0.78	1.9	2.5:1
Miocene, Bryan Mound, Texas	0.3	0.4	8.6	21.8	49.2	12.0	7.7	....	4.8	23	1.4	1.6	2.5:1
Woodbine, Pine Island, La.	0.2	1.0	20.2	44.7	29.6	2.9	1.4	....	4.6	8	2.5	2.8	2.5:1
Frie, High Island, Texas	0.1	0.6	8.5	17.4	41.2	17.0	15.2	6.4	7.1	44	1.7	1.8	2.5:1
Wilcox, LaGrange, Miss.	0.5	1.5	5.2	11.1	46.4	12.0	23.3	6.28	....	23.5	0.83	2.4	3.3:1
Cockfield, Fields, La.	0.3	0.7	2.7	1.3	1.7	2.0	91.3	0.0226	0.348	35	0.001	0.023	3.3:1
Miocene, Oretta, La.	0.3	0.4	2.6	3.7	6.1	17.0	69.9	1.2	....	19	0.52	0.67	3.3:1

TABLE 2
Effect of Different Plastics on Permeability of Consolidated Sand

Formation, Field, Location	SAND SIZE ANALYSIS (Percentage)—U.S. Standard Sieves							Water Permeability Darcys	Darcys After Consolidation Plastic Liquid Volume Ratio to Volume of Set Solid				
	On 40	40–60	60–80	80–100	100–140	140–200	Through 200		1.4:1	1.7:1	2.0:1	2.5:1	3.3:1
Eocene, Port Barre, La.	2.2	15.0	32.5	15.6	5.3	9.4	20.2	2.09	0.015	0.17	0.48	0.73	0.96
Frio, Boling Dome, Texas	1.6	4.5	42.4	29.7	12.6	7.5	1.7	11.3	0.088	0.26	1.0	4.0	3.0
Haas, Tepetate, La.	..	2.1	76.5	15.1	3.5	2.1	0.7	33.2	0.29	1.7	2.8	3.8	5.4
Miocene, Barbers Hill, Texas	0.4	3.9	25.0	28.4	28.7	7.6	6.0	9.0	0.052	0.25	0.60	1.5	2.4
Miocene, Bayou Blue, La.	0.6	4.3	63.2	17.2	7.3	5.7	1.7	14.2	0.25	1.3	1.5	3.2	5.5
Miocene, Bayou Blue, La.	48.5	36.4	11.4	1.9	0.8	0.4	0.6	70.0	0.89	4.0	5.6	9.7	13.5
Miocene, Boling Dome, Texas	4.3	17.2	41.7	21.0	7.5	4.6	3.7	22.6	0.17	0.46	1.9	5.1	5.3
Miocene, Cedar Point, Texas	..	1.5	32.0	42.5	13.5	6.9	3.8	9.7	0.075	1.2	1.3	2.0	3.0
Miocene, Chocahoula, La.	..	1.0	6.7	46.2	21.9	17.1	7.1	14.2	0.074	0.18	0.50	1.1	2.2
Miocene, Golden Meadow, La.	0.6	1.0	8.1	27.4	26.8	24.8	11.3	6.68	0.049	0.16	0.52	0.80	1.6
Miocene, Gueydan Dome, La.	..	15.1	45.3	29.2	1.9	6.4	2.1	19.9	0.22	0.92	2.6	3.6	5.4
Miocene, Richie Dome, La.	1.4	5.2	26.0	50.5	12.0	4.2	0.7	16.0	0.084	0.40	0.76	2.0	4.4
Miocene, University, La.	1.7	1.5	31.0	43.2	12.9	7.1	2.6	21.0	0.044	0.20	1.0	1.7	3.0
Oligocine, Manvel, Texas	3.5	20.5	54.1	17.5	3.0	1.1	0.3	24.9	0.26	1.3	2.4	5.3	5.6
Pleistocene, Cedar Point, Texas	0.3	2.5	19.1	52.7	9.8	9.0	6.6	17.3	0.085	0.52	1.2	2.3	2.5



LANE WELLS

Engineered

PACKER SERVICE

can show you how to get more work from your packers!

All kidding aside, you *can* get greater service from your packers by using the aid offered by Lane-Wells Engineered Packer Service. For this free service can help you plan packer setups with top efficiency for the given job, aid you in selecting just the right packer or packers for the set-up, and work out with you packer setting and packer pulling programs which do the job efficiently, safely, and with minimum strain on equipment. When you add to this the advice on packer maintenance and packer efficiency which is also available, it's easy to see *why*

Engineered Packer Service can help you get more work out of your packers.

Ask Your Lane-Wells Man!

Tomorrow's Tools—Today!

General Offices, Expert Office and Plant • 5610 So. Soto St. Los Angeles 58, California

Los Angeles • Houston • Oklahoma City
Lane-Wells Canadian Co. in Canada
Petro-Tech Service Co. in Venezuela

2 NEW CONDENSATE RECOVERY UNITS

for Higher Low-Temperature Profits!

GLYCOL INJECTION SYSTEM* *Brings High Recovery of Low Temperature Separation to More Wells . . .*

The new Glycol Injection System pioneered by BS&B has opened vast new profit potentials in the field of Low Temperature Separation. It cuts the pressure drop required to less than 500 psi—and depresses the water dewpoint of gas to sub-zero levels.

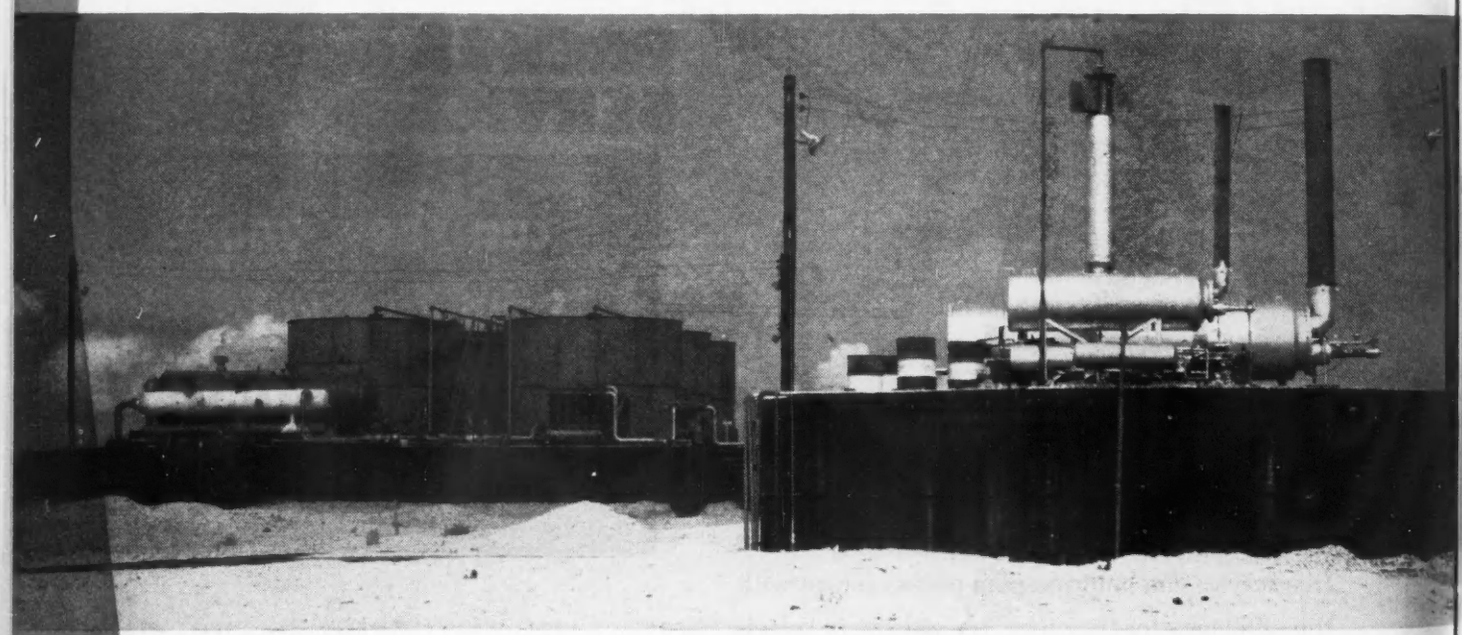
High Recovery Advantages of Low Temperature Separation are now available to lower pressured wells. The effective life of present low temperature installations can now also be extended far beyond former field pressure decline limitations.

Higher Recovery During Longer Service Life and lower water dewpoints will more than offset the small additional cost of the Glycol Injection System on small capacity installations. On operations producing 15 MM cubic feet or more of gas daily, Glycol Injection can considerably reduce your equipment investment.

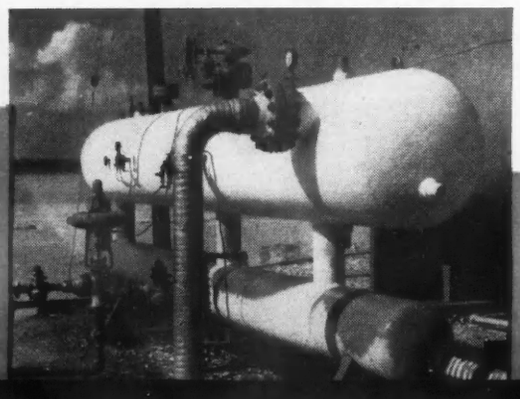
Low Operating Costs. The BS&B Glycol Injection Pump utilizes gas from the low pressure separator for power* . . . and glycol consumption is negligible—less than .015 gal. per barrel of oil produced.

Ideal for Stabilization with the new BS&B Simplified Stabilizer—a combination that produces maximum recovery and profits.

Dewpoint Depression is far below dehydration with ordinary low temperature separation. Dewpoints 20° to 40° F. below separator temperature can be obtained.



20,000,000 cf of Gas Daily pass through this BS&B Low Temperature Glycol Injection system for pioneering Atlantic Refining Company on Mustang Island, Texas . . . It is designed to eventually handle double this load. Best proof of the glycol system's performance in recovery, dewpoint and economy is Atlantic Refining's current order for two additional BS&B Glycol-LTS systems of 60MM and 25MM capacities. On platform at left are the frost-covered low temperature separator, the low-pressure distillate-glycol separator, heat exchanger and free water knockout, with 6 BS&B tanks behind them. On the foreground platform are the Glycol Regenerating unit and the BS&B 70S Heater.



Operating at 6° F. is this horizontal low temperature separator on Atlantic Refining's efficient Mustang Island glycol injection installation. Glycol injection permits lower temperatures with less pressure drop across the choke.

*Patented

PIONEERED AND PROVED BY BS&B

for Low-Cost Field Stabilization!

BS&B SIMPLIFIED STABILIZATION

Pays Out Quickly in Extra Recovery . . . Low Investment . . . Conservation

Now, for the first time, BS&B makes available a high efficiency stabilizer —so low in cost and so profitable in extra recovery that it will pay out in a matter of weeks or months—yet so simple that it can be operated by the lease pumper with only minimum supervision.

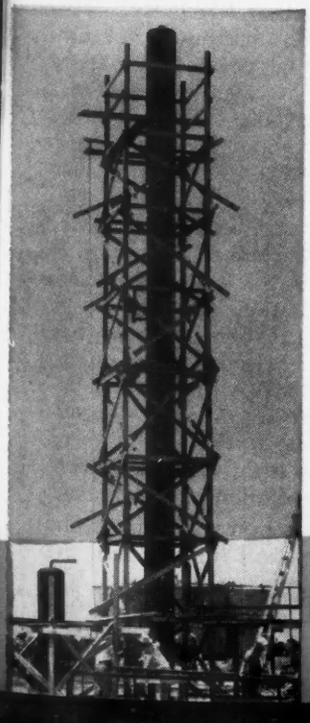
Versatile in Its Uses—particularly applicable to condensate production from low Temperature separators, Glycol Injection Systems and conventional separation. The BS&B Stabilizer is available in any required capacity for the profitable stabilizing of oil, condensate or gasoline right on your lease.

Delivering Fully Stabilized Oil, condensate or gasoline to storage, low pressure flash losses of desired fractions are virtually eliminated—increasing marketable recovery far above any other field method. Vapor pressures are controlled . . . gas from the stabilizer can be compressed to pipeline requirements in a single stage . . . and the Stabilizer so conserves oil that from a recovery of 1246 gallons condensate only 9 gallons of pentanes plus were lost in overhead gas—an efficiency of 99.3%.

Far Lowest in Investment of any stabilizer of comparable capacity, because the BS&B Stabilizer requires no reflux pumps, cooling coils or extra equipment besides the safe, economical BS&B indirect heater.

BS&B STABILIZER PAYING OUT IN 6 MONTHS ON 2.5 Mmcf PRODUCTION

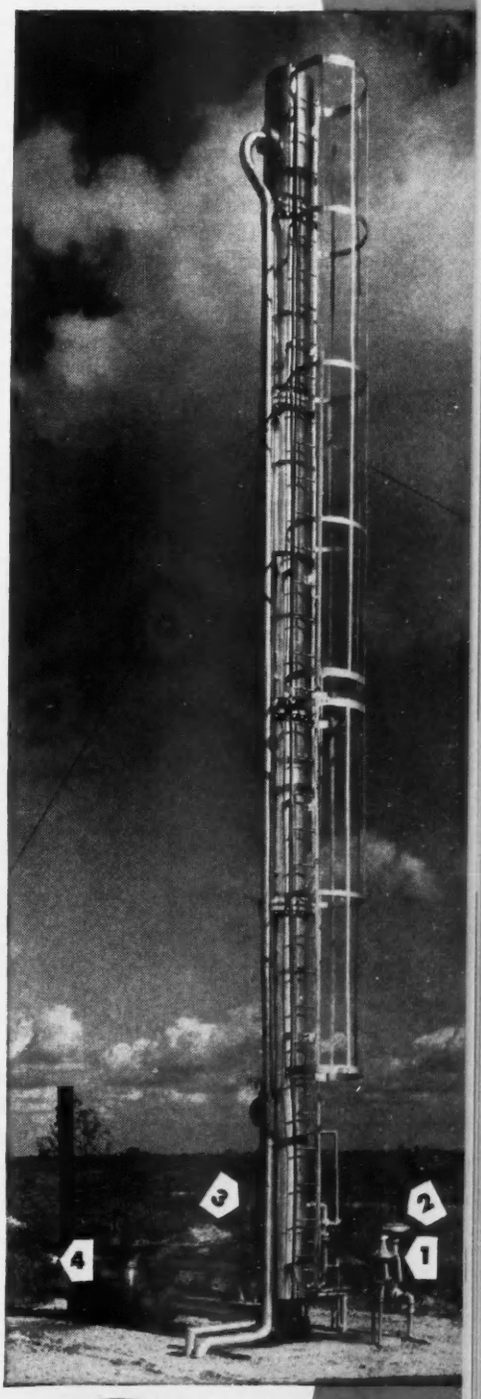
This BS&B Stabilizer, installed for a leading independent producer in Colorado County, Texas, is more than doubling the extra recovery rate of low temperature separation alone. Recovery is now 70.25 bbls. fully stabilized condensate from 2.37 Mmcf—9.6 bbls. more than LTS recovered alone. Compared to the original conventional separation, LTS alone increased recovery 12.6%; when the stabilizer was added, the increase rose to 29.3%. The added recovery is paying for the stabilizer in less than 6 months!



Greatest Operating Simplicity! Only 4 fully automatic BS&B controls are needed to operate the BS&B Stabilizer. (1) Back Pressure Valve (2) Liquid level control (3) temperature control (4) High temperature shut-off.

STABILIZER PRODUCING 10,000 GAL. GASOLINE

Producing as much as 10,000 gal. of 18 lb. Reed vp gasoline for Bates & Cornell in Acadia Parish, La., this BS&B Stabilizer is paying for itself in a few weeks—in extra recovery of a higher priced, top-profit product. The Stabilizer operates in conjunction with an efficient BS&B glycol injection LTS system. Illustration shows plant under construction.



Protected by Patents Pending

Descriptive Bulletins are available. Write for full information or call your nearest BS&B Service Branch.

EFFICIENCY BS&B RELIABILITY

BLACK, SIVALLS & BRYSON, INC.

Oil & Gas Equipment Division—Dept. 24-B • 2131 Westwood Blvd., Oklahoma City, Okla.

to set solid volume, the amount and type of silicates present in the sand, and the size, shape, and angularity of the sand grains.

Technique Used

When plastics were first introduced from the consolidation of sand, the procedure was to displace the plastic into the well with only sufficient oil flush to clear the tubing, thereby leaving plastic over the perforated interval of the casing. Excess plastic left in the hole after it had set was drilled out and the well placed on production. In a number of the treatments in which this procedure was used, it was found that the well responded as if there was a check valve within the formation. It was possible to pump fluid into the formation, but no fluid would be given up by the formation. The exact cause of this phenomena has never been determined. Many hypotheses have been discussed as possible explanations; such as the plastic in and behind the perforations; and the silt-like materials within the formations being packed around the extremities of the consolidated section.

Another problem encountered under this old procedure of applying sand consolidation plastic was the formation of plastic beads. These beads were usually always present following a sand consolidation treatment. While they did not influence the effectiveness of the plastic to control the sand, they were troublesome for several days following a plastic treatment due to the plugging of the chokes. A clue to the explanation of the formation of the beads was the discovery that the viscous plastics were the only ones which formed the beads. It was thought that some of the viscous plastic probably adhered to the walls of the tubing during the displacement of the plastic down the tubing and at some later time became loose dropping through the oil, thereby forming the beads. This problem has been solved by using low viscosity plastics.

New Technique

The trouble experienced in the past in which the formation seemed to act as if there was a check valve present, has been corrected by means of a new procedure for applying the plastic. This new technique, briefly, is to use mud acid ahead of the plastic to remove the mud cake and clays from the formation. Following this treatment, the plastic is squeezed into the formation and completely displaced out of the hole and out of perforations by the use of oil.

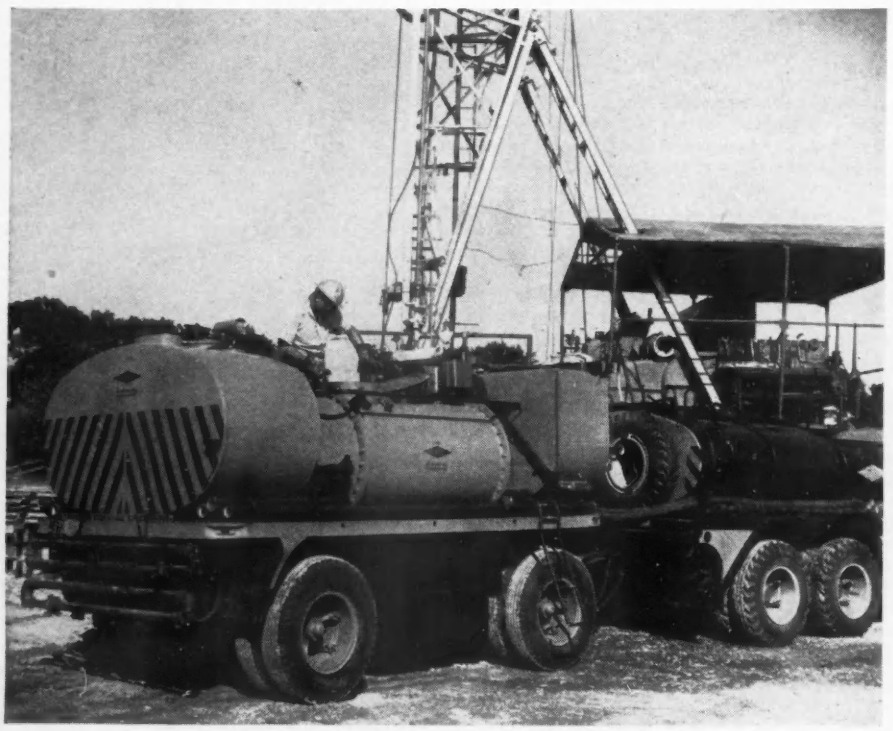
A typical sand consolidation plastic treatment using the new technique is carried out in the following manner. A retrievable squeeze tool with sufficient tailpipe to go below the lowest casing perforation is run in the hole on the tubing or drill pipe. With the bottom of the tailpipe two or more feet below these perforations and the tool hanging unset above the perforations, five barrels of water followed by five barrels of mud acid are displaced down the tubing with sufficient oil to spot the water around the tailpipe and the squeeze tool. The purpose of this is to clear the perforated interval of mud. The squeeze tool is then raised and set at a point such that the bottom of the tailpipe is two to six feet above the perforations. The squeeze tool remains in a set position at this point for the remainder of the treatment. The remaining water and five barrels of acid are slowly squeezed into the formation. Ample time is allowed for the acid to remove the mud filter cake from the perforated interval and also to react with any clay or bentonitic material in the formation.

Mixing Plastic

The plastic is now mixed on the surface (usually 150 gallons on the first stage and 100 gallons on subsequent stages), and the correct amount of catalyst is added to control the plastic setting time for the given formation temperature. While the plastic is being mixed, a sufficient quantity of fluid plug (carbon tetrachloride) is pumped into the tubing to form 100 feet of a liquid plug ahead of the plastic. Purpose of this fluid plug is to prevent the plastic from falling through the oil while it is being displaced down the tubing.

Plastic is then pumped from the plastic mixing tank into the tubing and followed directly by oil. Oil is pumped at such a rate that the displacement down the tubing never exceeds a linear velocity of 100 feet per minute. When sufficient oil flush has been used that the plastic is six barrels above the bottom of the tubing, the pump is operated at a speed to give a displacement for the next ten minutes of one-half barrel per minute. The injection pressure is carefully recorded during this interval in order that it may be compared with a similar injection test following the treatment. The comparison is important due to the fact that some idea of the distribution of the plastic within the formation may be had from the pressures recorded during the injection tests. An increase in injection pressure means that the permeability of the formation has been reduced, which is the case when there is a good distribution of the plastic.

After the injection test is made, the pump is slowed still further until the

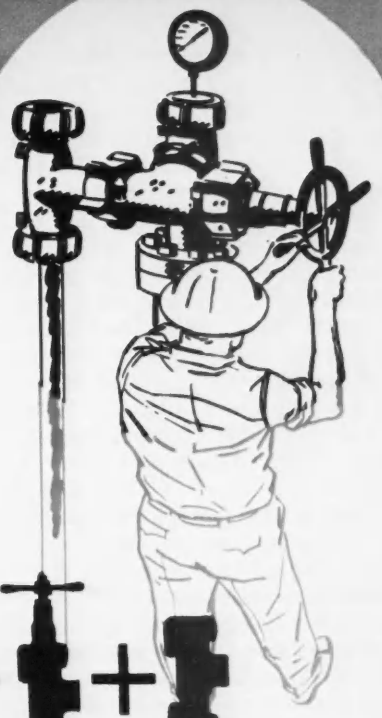


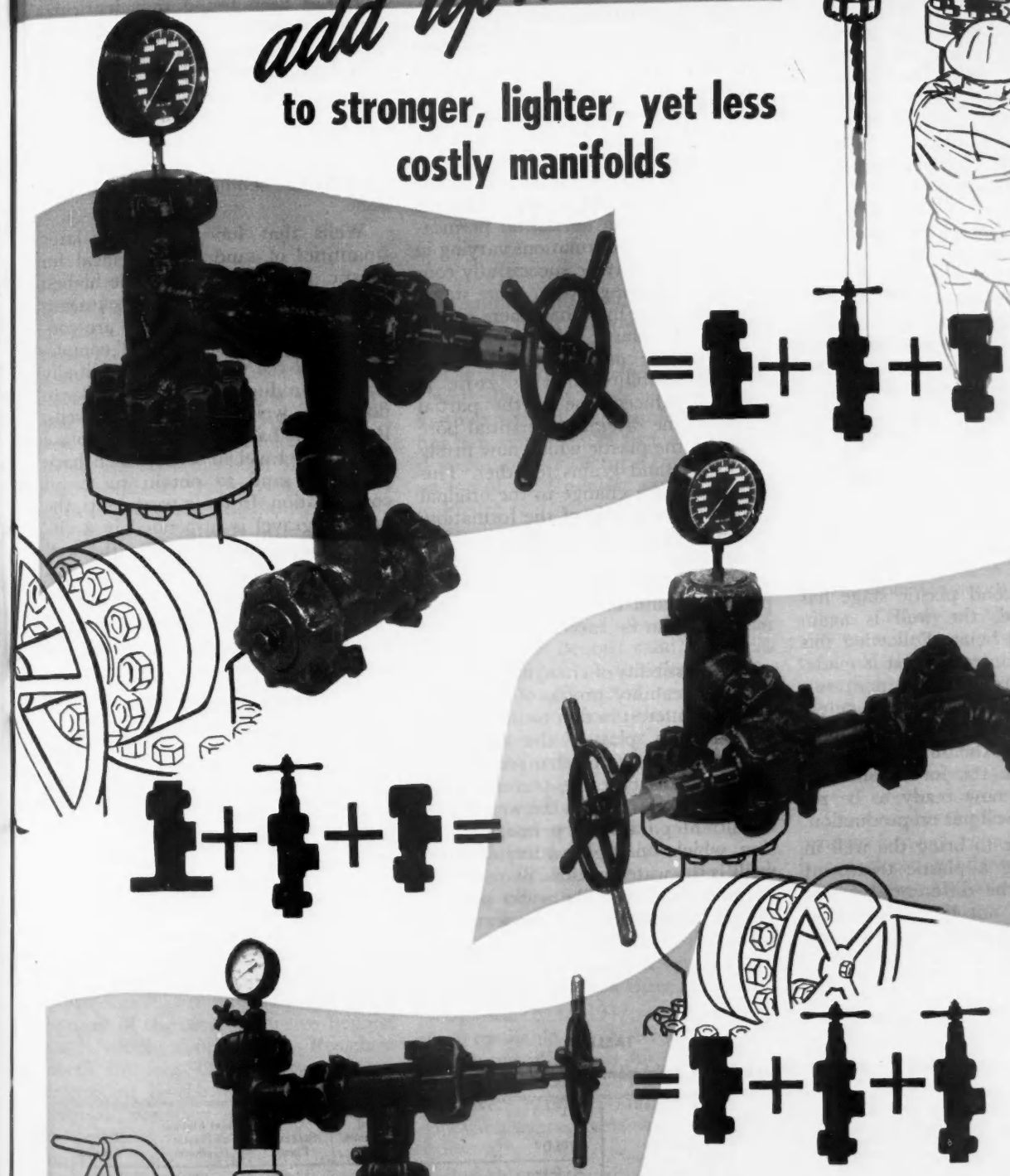
Special equipment for applying plastics in sand consolidation consists of a trailer on which are mounted mixing and displacement tanks. This unit operates in conjunction with a high-pressure pump.

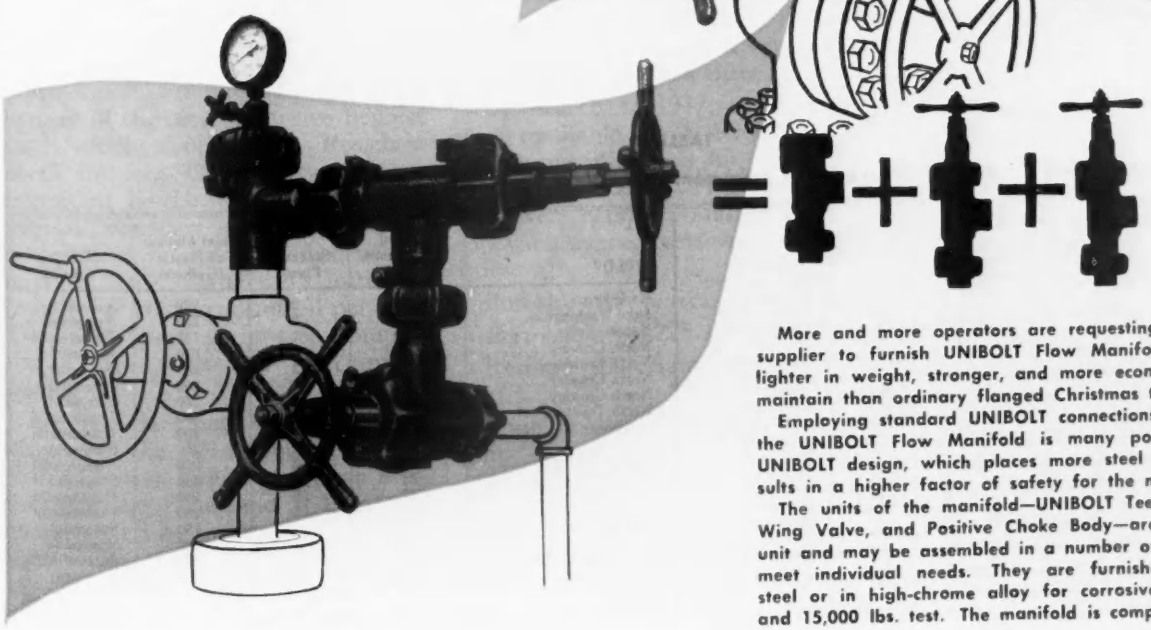
Unibolt Christmas Tree Fittings

add up...

to stronger, lighter, yet less costly manifolds







More and more operators are requesting their Christmas tree supplier to furnish UNIBOLT Flow Manifolds because they are lighter in weight, stronger, and more economical, and easier to maintain than ordinary flanged Christmas tree wings.

Employing standard UNIBOLT connections rather than flanges, the UNIBOLT Flow Manifold is many pounds lighter, yet the UNIBOLT design, which places more steel in shear, actually results in a higher factor of safety for the manifold.

The units of the manifold—UNIBOLT Tee or Cross, Adjustable Wing Valve, and Positive Choke Body—are pressure-tested as a unit and may be assembled in a number of combinations to best meet individual needs. They are furnished in regular forged steel or in high-chrome alloy for corrosive wells—6,000, 10,000 and 15,000 lbs. test. The manifold is completely salvageable.

THORNHILL-CRAVER COMPANY • P. O. BOX 1184 • HOUSTON, TEXAS

injection rate is approximately one-third barrel per minute. This injection rate is held until the end of the treatment. The recording gauge chart gives a good picture of the plastic entering the formation due to the slight pressure increase caused by the fact that the plastic is more viscous than the oil and carbon tetrachloride ahead of it. A subsequent drop in pressure indicates that the oil is entering the formation behind the plastic.

After the plastic has been displaced by oil from the tailpipe, the hole and the perforations, the well is closed in until the plastic sets. Setting requires from 8 to 24 hours. Occasionally it is necessary during the first two hours of this period to pump a few extra barrels of oil to insure that the perforations remain open.

After a 24-hour shut in, an injection test similar to the one mentioned above is made. A comparison of these two injection pressures gives information as to whether or not more plastic should be used. If the injection pressure is not high enough, it is desirable to continue with the second plastic stage. The second plastic stage is then carried out exactly as the first stage, except that the acid treatment is not used.

After the second plastic stage has been completed, the well is again closed in for 24 hours. Following this period another injection test is made. From this information the desirability of a third plastic stage is determined. If no additional stages of plastic are indicated, the oil in the tubing is squeezed into the formation. The squeeze tool is now ready to be released and the well put on production.

It is desirable to bring the well in slowly following a plastic treatment in order that the differential across the plastic will not be too great. If the well flows, it is best to use a small choke such as 7/64 or 8/64-inch; or if it is necessary to swab the well in, it is best to swab slowly. After the well has flowed for 24 hours, it may be pulled at any rate that conforms to good production practice.

Field Results

Results of the most recent field treatments in which the above procedure was used, are given in Table 3. It will be noted that a little better than 80 percent of the treatments were successful in controlling the sand.

The best type of formation for the use of plastic is one in which there is little variation in horizontal permeability. However, formations varying in permeability may be successfully consolidated by using two or more stages of plastic. The hypothesis here is that most of the plastic applied originally goes into the most permeable zone. The permeability of this zone is thereby reduced due to the partial filling of the original interstitial pore space by the plastic which now firmly binds the sand grains together. This brings about a change in the original permeability profile of the formation. When more plastic is applied, it enters some other section of the formation. Thus by using two or more stages of plastic, a sand body of varying permeability can be successfully consolidated.

This possibility of changing the original permeability profile of a formation is of interest in that by use of sand consolidation plastics the water/oil ratio of a well can be changed. Treatments of this type are performed by forcing the plastic into the well where it will enter the most permeable section which on high water/oil ratio wells is the water section. By reducing the permeability of the water section, the plastic will decrease the water/oil ratio.

Results have been most favorable where less than ten feet of formation has been consolidated. This is probably due to the fact that there is less variation in permeability in the shorter sections.

It has been found that lenticular formations which have thin streaks of shale a few inches thick in the main sand body are poor prospects for sand consolidation. This is probably because the impermeable shale gives way after the sand has been consolidated, thereby allowing the passage of sand from behind the consolidated zone.

Wells that have produced large quantities of sand are not ideal for plastic. Results show that the highest percentage of successful treatments are obtained on wells which are consolidated upon the original completion, or at the time the wells initially start to produce sand. This applies to flowing as well as old pumping wells. Recently it has been possible to place sand and gravel in wells which have produced sand to obtain successful consolidation. In these treatments, the sand or gravel is suspended in a viscous fluid and carried into the well through the perforations and deposited against the formation. After sufficient sand or gravel has been placed into the well, the material is then consolidated.

ACKNOWLEDGMENT

Prepared for WORLD OIL from a paper presented before the Mississippi Subsection, AIME, Laurel, Miss.

REFERENCES

[1] R. H. Smith, and A. C. Polk, Jr.: "Use of Plastics in Consolidating Loose Sands in Wells." AIME, Petroleum Tech. (T.P. 2147), 10, No. 2, 1947.

[2] P. H. Cardwell: "Plastic Used to Consolidate Incompetent Formations." AIME, Petroleum Tech. (T.P. 2148) 10, No. 2, 1947.

[3] P. H. Cardwell: "Chemical Removal of Clays." *Oil and Gas Journal*, 46, No. 43. pp. 130, 1948.

TABLE 3

Sand Consolidation Treatments—Louisiana Gulf Coast Area

FIELD	Amount Perforations (Feet)	Stages of Plastic	Total Amount of Plastic (Gallons)	Results	FIELD	Amount Perforations (Feet)	Stages of Plastic	Total Amount of Plastic (Gallons)	Results
Abbeville	2	2	250	Successful	Hackberry	10	2	250	Successful
Abbeville	5	2	250	Successful	Lake Washington	10	2	250	Successful
Breton Island	3	2	250	Successful	Napoleonville	6	1	150	Unsuccessful
Cankton	4	1	150	Successful	North Crowley	3	2	250	Successful
Ged	15	1	150	Unsuccessful	North Crowley	4	2	250	Successful
Ged	10	1	150	Successful	North Crowley	4	2	250	Successful
Golden Meadow	4	2	250	Successful	North Crowley	2	2	250	Successful
Golden Meadow	6	2	250	Successful	North Tepetate	9	3	350	Unsuccessful
Golden Meadow	4	3	350	Successful	Oldenburg	6	2	400	Unsuccessful
Golden Meadow	6	1	150	Successful	Perkins	4	2	250	Successful
Golden Meadow	5	2	250	Successful	St. Martinville	4	2	250	Unsuccessful
Golden Meadow	4	1	150	Successful	St. Martinville	18	3	450	Successful
Golden Meadow	6	2	250	Successful	St. Martinville	7	2	250	Unsuccessful
Golden Meadow	11	3	400	Successful	St. Martinville	6	2	250	Unsuccessful
Golden Meadow	6	2	250	Successful	Sulphur Mines	10	1	150	Successful
Golden Meadow	19	3	300	Successful	Sunshine	9	3	400	Successful
Hackberry	3	1	250	Successful	Sunshine	5	1	150	Successful
Hackberry	6	1	150	Successful	Tepetate	4	3	350	Successful
Hackberry	10	2	250	Successful					

WATER INJECTION IN PRIMARY PRODUCTION PAYS OFF

By W. H. DAVIS

Sohio Petroleum Company, Centralia, Ill.

IN THE past few years operators in the oil production industry have been giving increasing attention to early application of presure maintenance to those reservoirs which appear susceptible to this type of recovery. Although pressure maintenance by gas injection has been instituted in many fields in recent years, the application of early water injection has received comparatively little attention. The Patoka Rosiclare is one of the few reservoirs having a planned water injection program initiated early in the producing life of the reservoir. The reaction to water injection has been both revealing and gratifying.

Discovery Data

The Patoka Rosiclare pool was dispool was discovered in June, 1938, by the completion of Adams Oil and Gas Company Pugh 1. The well is located in 29, 4n, 1e, Marion County, Illinois. The discovery well was completed in the Rosiclare sandstone at a plug-back total depth of 1588 feet. It was immediately equipped to pump and initital production was 48 barrels of 40 degree API gravity oil per day.

The discovery of the Rosiclare reservoir was subordinated by the development of the more extensive Benoist sand which overlies the Rosiclare about 150 feet. Only five wells were completed in the Rosiclare as commercial producers prior to the commencement of water flood development in 1948. These wells initialled from 15 to 115 barrels of oil per day. Two wells were water-free completions; three wells had high initial water-cut.

The Rosiclare sand is classified as a member of the Ste. Genevieve formation, Meremac group, of Upper Mississippian age. The sand at Patoka is characterized by numerous thin shale laminations with occasional thin streaks of lime. It dips to water on all but a portion of the east and west sides and is naturally divided into two reservoirs by a narrow neck of low permeability.

The reservoir is formed by an anticlinal structure with a northeast-southwest trend. The Patoka Rosiclare has a maxium of 20 feet of productive closure. A structural contour map on top of the Rosiclare sand is shown in Figure 1.

The major operator started accumulating data for a possible future water flood from the date of completion of the first Rosiclare well. During the water-flood development of the shallower Benoist sand, 12 wells were drilled to the Rosiclare. These wells were cored, tested, and plugged back to the Benoist. In 1946 and 1947, three evaluation wells were drilled and cored to determine the fluid saturations of the reservoir. The cores of previous wells had obviously been flushed with drilling mud and the fluid saturation analyses were considered indicative only of water-flood residual oil saturation. The evaluation wells were drilled with rotary tools. One was cored with rotary and two with cable tools. Oil was used as the coring fluid in all three wells.

By March 1, 1947, core analyses were available on 26 Rosiclare wells and active planning for water-flood development began. The core analysis data were compiled and revealed the following average reservoir characteristics:

Porosity—19 percent.

Permeability—225 millidarcys.

Residual Oil Saturation—65 percent.

Connate Water Saturation—30 percent.

Productive Area—460 acres.

Net Sand Thickness—9 feet.

Oil-Water Contact—1088 feet.

Permeability varied from 0 to 630 millidarcys and the distribution index indicated poor uniformity of distribution.

An analysis of a bottom-hole sample from an evaluation well indicated the viscosity at saturation pressure of 160 pounds per square inch to be 4.1 centipoises. Viscosity at the original bottom-hole pressure of 580 psi was 4.3 centipoises. The original solution gas-oil ratio was estimated to be less than 50 cubic feet per barrel. The formation volume factor was estimated to be 1.03 barrels per barrel and the bottom-hole temperature was 82° F.

Study of Methods

A complete analysis of the several types of water injection led to the conclusion that a peripheral pattern was the most feasible plan economically. Nearly all the oil productive zone was underlain by water, making it possible to inject water around the edge of the productive limits.

The peripheral pattern was a compromise between economics and what is considered good engineering. The ideal number and location of wells to achieve maximum recovery was influenced to the extent that a sufficient number of strategically located wells had to be drilled to produce the recoverable oil within a reasonable time.

Water input wells, with few exceptions, were located around the perimeter of the oil productive zone and

BENEFITS FROM one water injection project are described. The author discusses the initial development of production and how an injection program was instigated during the early life of the field. No attempt is made to present a detailed study of the reservoir, but charts on production history, water injected and water produced attest for the results obtained.

completed in the sand below the water table. Producing wells were located higher on structure in positons where they could be used as future input wells when watered out. Well locations are shown in Figure 1.

In order to utilize the proposed method of peripheral water injection, it was necessary to utilize the royalty interests. Careful consideration was given to the different methods of arriving at each royalty owner's equitable share of the oil produced. Data gathered from all wells which penetrated the Rosiclare made possible an accurate determination of the productive acre-feet underlying each lease. The acre-feet determination appealed to all parties concerned as being the method of unitization least subject to inequity and it was made the basis for calculating participation factors.

Because the physical characteristics and fluid saturations of the northern and southern parts of the reservoir varied considerably, two separate units were established. The property line running through the narrow neck was established as the dividing line.

Drilling for water-flood development was commenced in November, 1948, and completed in May, 1950. A total of 14 input and 13 producing wells were completed. All wells were drilled or deepened with rotary and cleaned out with cable tools. Casing was cemented in both producing and input wells with 250-400 sacks of cement. All wells were eventually selectively shot with nitroglycerine. Input wells were connected to take water directly down the casing. Producing wells were equipped with two-inch tubing, five-eighth-inch rods, and electrically-driven pumping units.

Water supply for the Rosiclare was delivered by the same system which supplied the Benoist Water Flood. Since this system has been described in detail in recent publications, it will be covered only briefly here.

Brine water was pumped from the Tar Springs sand at a depth of 1000 feet. The water was aerated; treated with ferric chloride, lime, and activated silicate; filtered through pressure-type sand and gravel filters; and distributed at 500 psi pressure by a multistage centrifugal pump.

The natural performance of the Patoka Rosiclare was disappointing. Wells were characterized by low productivity indices and it was apparent that primary production would be too low to justify complete development of the reservoir. The daily oil production at the time wells were shut down for unitization was 60 barrels. Cumu-

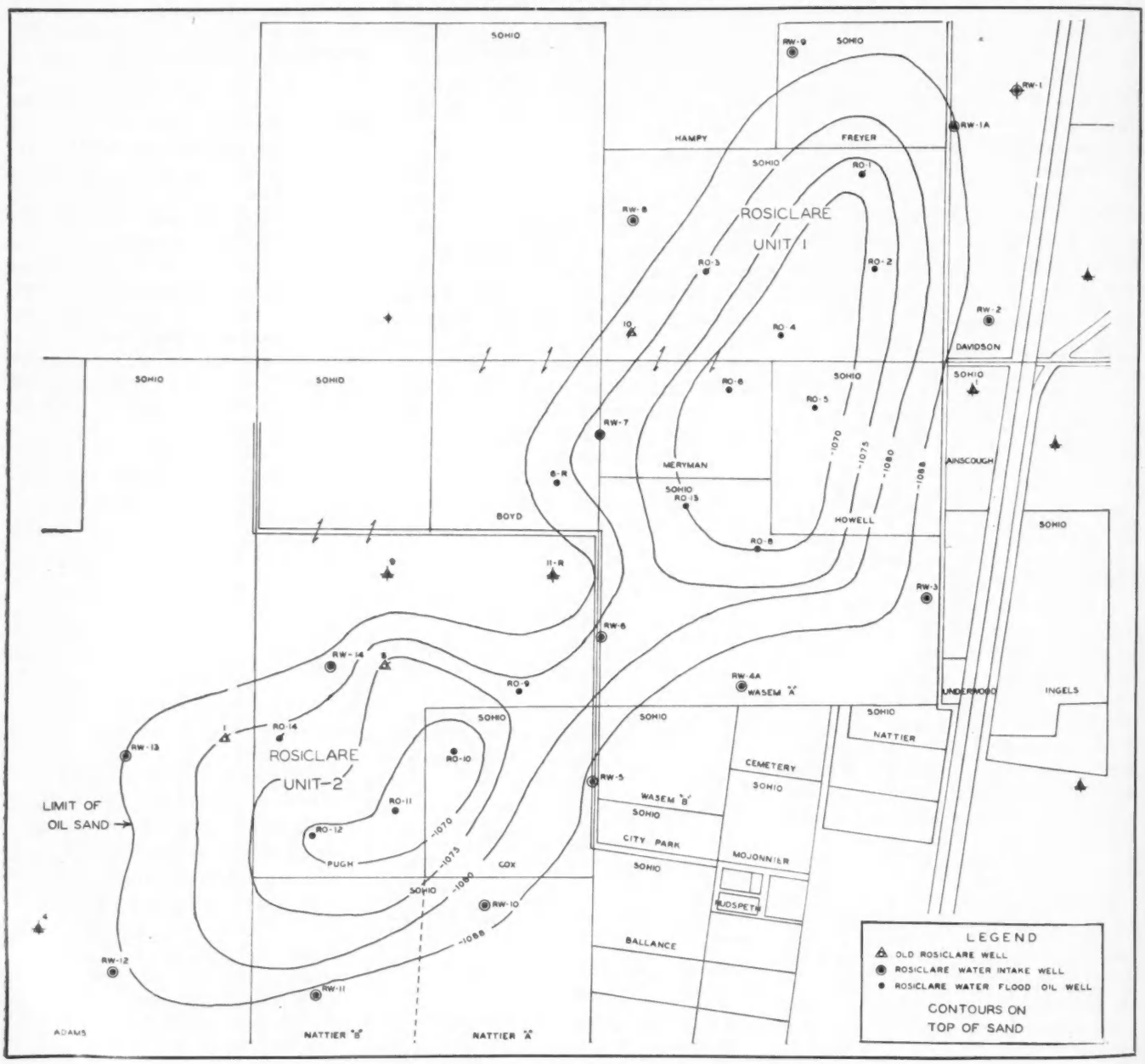
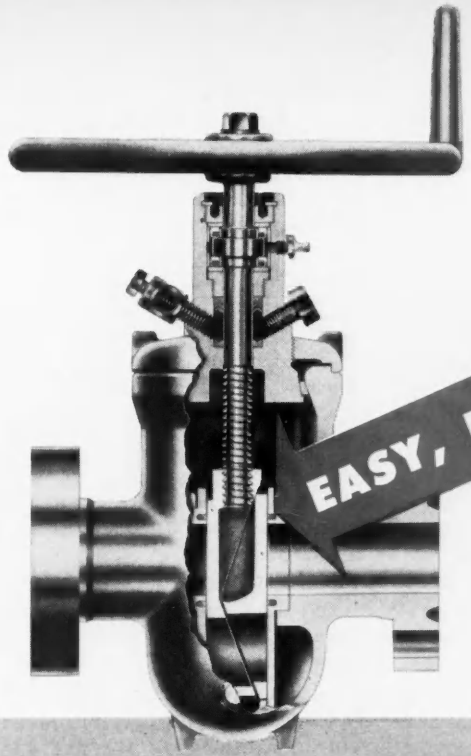


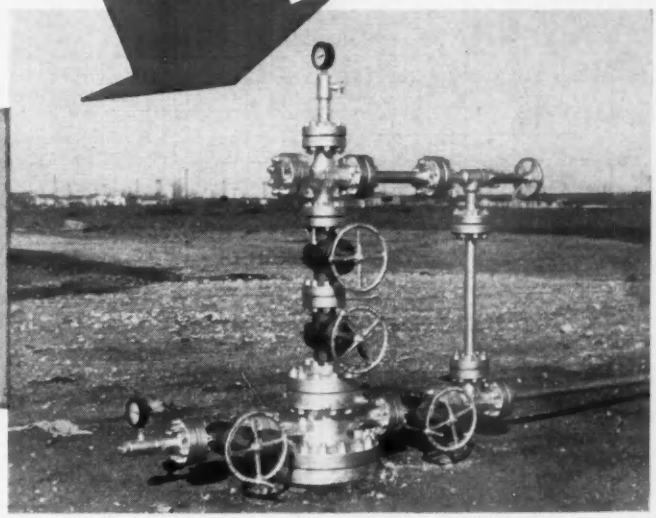
FIGURE 1. Map of the Rosiclare water flood operation in Patoka field, Patoka, Ill.

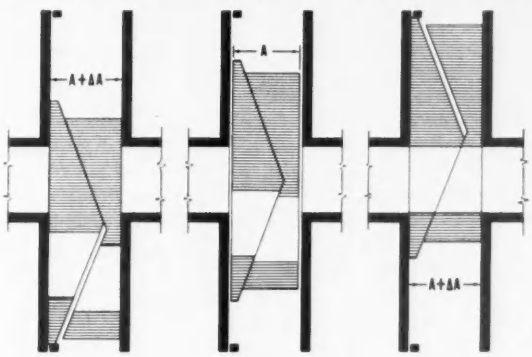


EASY, POSITIVE SHUT-OFF HERE.. MEANS SURE, SAFE CONTROL HERE!

W-K-M Parallel Expanding Gate provides a pressure-tight seal, open and closed — permits free-running operation under full-rated pressure.

Double-thrust Roller Bearings, ground stem threads, superfinished stem where it passes through the packing, contribute to the easy operation of W-K-M valves.





In closed position, the gate (left) and segment (right) seal tightly against both seats.

When opening or closing, the gate and segment are in neutral position, permitting free upward or downward movement of the gate assembly.

When open, the gate and segment again seal tightly against both seats and the bore of each lines up perfectly to provide a smooth, turbulence-free passage.

For the greatest safety, greatest operating reliability, oil men the world over specify W-K-M valves for their Christmas trees. The basic design of W-K-M valves (illustrated at left) provides a sure, tight seal in opened and closed positions and free-running operation while opening or closing.

Oil men specify W-K-M, too, because of its large and competent field organization qualified to render field emergency service and assist W-K-M valve users in any valve problem. W-K-M valves may be serviced and even completely overhauled without removing them from the Christmas tree.

Specify W-K-M for the surest and safest well control — for W-K-M valves are by far the most economical in the long run. 80% of the world's high pressure wells are controlled by W-K-M valves.

All W-K-M Valves Have

Through-Conduit Fluid Passage • Parallel Expanding Gate Assembly • Oversize Replaceable Seats Pressure Seal Bonnet • Double Row Thrust Bearings on Stem • Internal Lubrication

W-K-M COMPANY
P. O. BOX 2117 HOUSTON 1, TEXAS
727 W. SEVENTH STREET, LOS ANGELES, CALIF.
EXPORT OFFICE: 30 Rockefeller Plaza, New York, N. Y.

W-K-M *Valves*

OILFIELD • PIPE LINE • PROCESS VALVES

lative production at this date was estimated to be 153,000 barrels or about 37 barrels per acre foot.

After water injection was commenced, the oil rate increased gradually to a peak of 1040 barrels per day in June, 1950. The current oil rate is 800 barrels per day. Cumulative water flood oil production to January 1, 1951, was 513,000 barrels or 124 barrels per acre foot. The producing wells under water flood have been characterized by gradually decreasing productivity indices. Although bottom-hole pressure is now almost twice the original pressure, most wells are now producing at a rate lower than the initial rate.

Figure 2 shows the daily performance or Unit I, RO-2, before and after water injection. The well is located low on structure and is not indicative of typical Rosiclare performance. It is, however, the only well on which production data are available before and after water flood development.

Daily flood water production has been erratic. Two producing wells which were low on structure have been shut down because of high water-oil ratio. Cumulative flood water production to January 1, 1951, was 234,000 barrels. To January 1, a total of 988,000 barrels of water had been injected, resulting in a ratio of water injected to water flood oil produced of 1.9. Figure 3 shows the daily flood performance of the combined Rosiclare units.

The cost of water flood development was paid out in a few months after drilling operations began and the Rosiclare flood operated at a profit since the early stages of development. The existence of an adequate water supply and treating system for the Benoist water flood in the same field lowered the development costs considerably below the average for a flood of comparable size.

The fact that the majority of the data required for properly planning a water flood was acquired during the primary production phase of the Rosiclare and during the water flood development of the Benoist sand also kept the development cost at a minimum.

The final major factor contributing to an early pay-out was the fact that primary production was small and the reservoir was virtually virgin when water flood development was started. As a consequence, new producing wells had a substantial initial production even before they were affected by water injection.

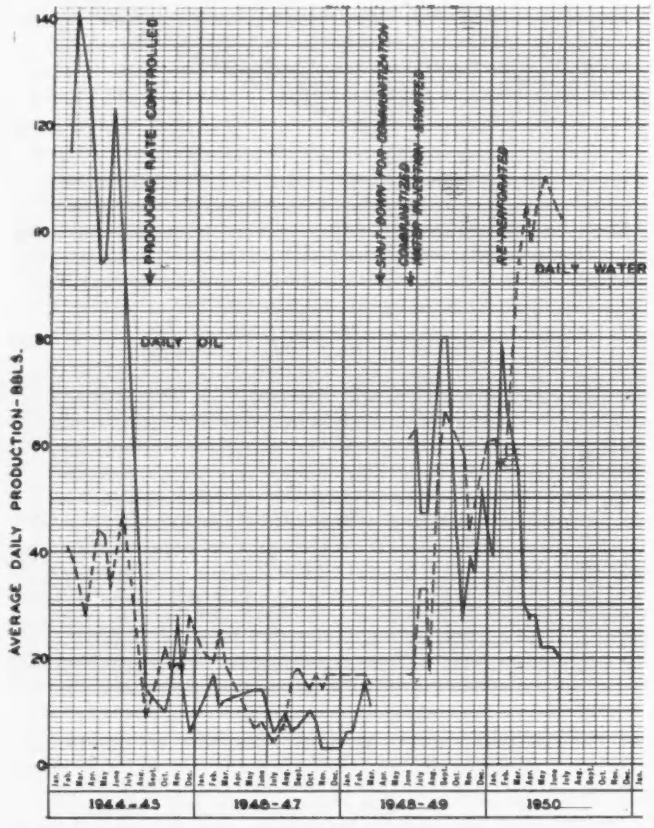


FIGURE 2. Patoka Rosiclare water flood oil well performance.

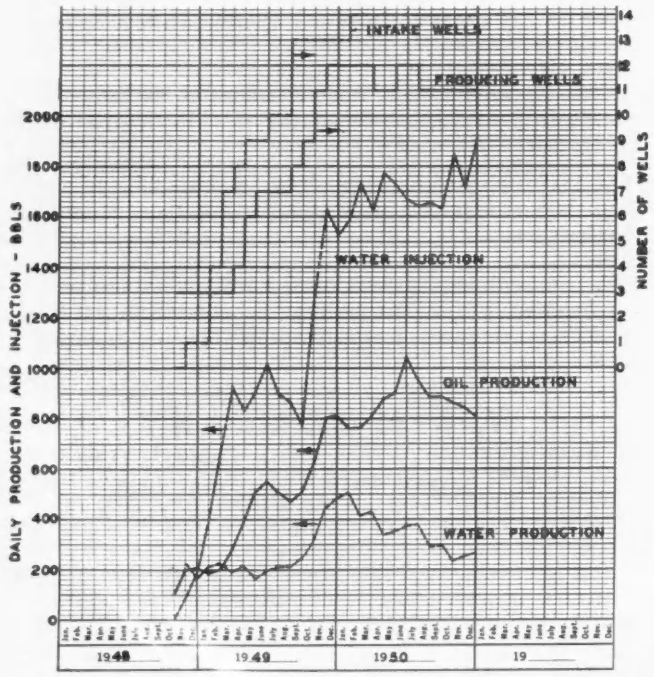


FIGURE 3. Patoka Rosiclare water flood daily flood performance. Total Rosiclare.

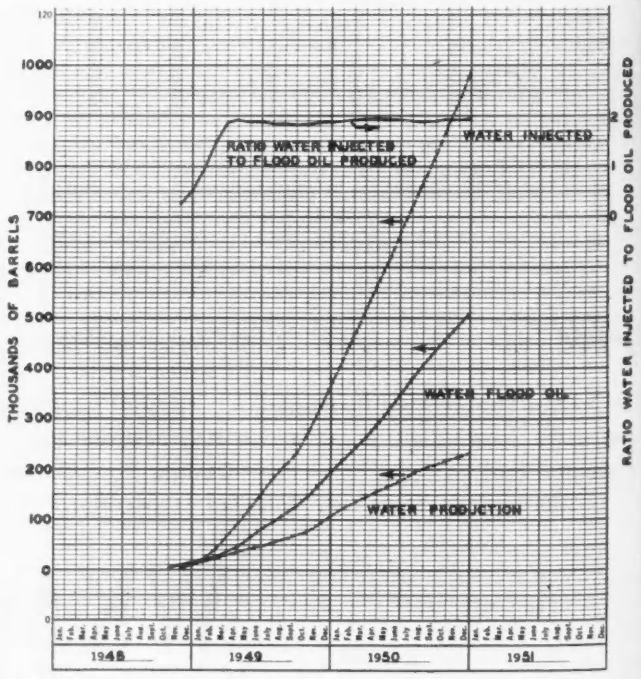
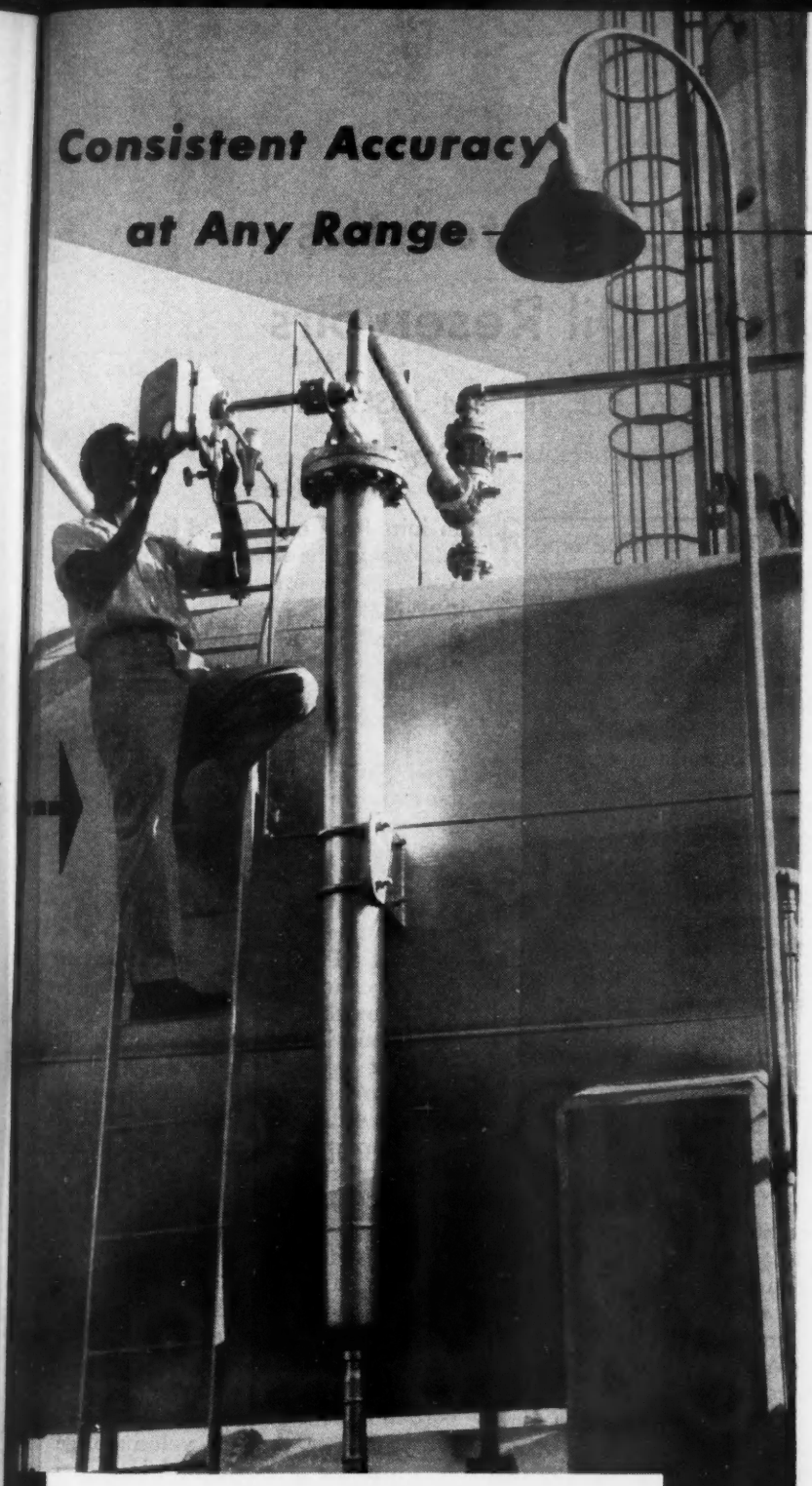


FIGURE 4. Patoka Rosiclare water flood cumulative performance. Total Rosiclare.



BS&B

CLIMAX

LIQUID LEVEL CONTROL

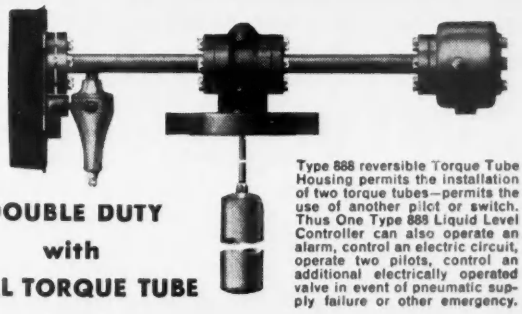
TYPE 888

Any level control is accurate when first set—but BS&B's new Climax Type 888 Liquid Level Controls are **consistently** accurate! Whether the liquid level range is ¼" or 120"—the CONE PIVOT suspension point of the new Climax 888 is friction free—largely self-compensating for misalignment—does away with the sticking action of outboard bearings or the climbing of knife edges.

To inspect or replace the cone point—external positioning makes the job a matter of minutes.

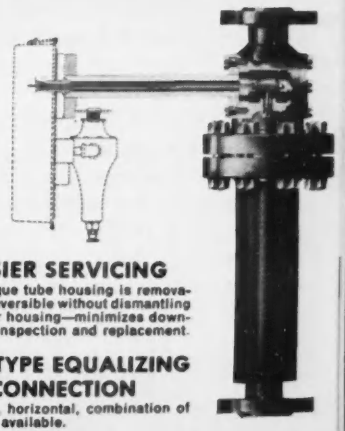
TYPE 888 TORQUE TUBE is stronger, heavier and made of INCONEL—the material found most corrosion resistant under torsion stresses. (Other alloys available in stock for special conditions.) The torque tube shaft is rigidly centered by a friction-free ball bearing.

HEAVY TORQUE TUBE helps provide longer life—permits the employment of heavier displacement elements with high safety factor and wider gravity range application.



DOUBLE DUTY with DUAL TORQUE TUBE

Type 888 reversible Torque Tube Housing permits the installation of two torque tubes—permits the use of another pilot or switch. Thus One Type 888 Liquid Level Controller can also operate an alarm, control an electric circuit, operate two pilots, control an additional electrically operated valve in event of pneumatic supply failure or other emergency.



EASIER SERVICING
—the torque tube housing is removable and reversible without dismantling controller housing—minimizes downtime for inspection and replacement.

ANY TYPE EQUALIZING CONNECTION
—vertical, horizontal, combination of both, are available.

CLIMAX BS&B CONTROLS

WRITE TODAY FOR NEW, COMPLETE CLIMAX SECTION 103 CATALOG (TYPE 888 LIQUID LEVEL CONTROLLER)

BLACK, SIVALLS & BRYSON, INC.
CLIMAX CONTROLS DIVISION, DEPT. 61-B
7500 E. 12TH, KANSAS CITY 3, MO.

Variation of Oil Characteristics With Elevation in Oil Reservoirs

By CECIL Q. CUPPS, PHILIP H. LIPSTATE, JR., and JOSEPH FRY

Petroleum Engineers, U. S. Bureau of Mines, Laramie, Wyo.

THIS STUDY, prepared especially for World Oil from a Bureau of Mines Report of Investigation, reveals that contrary to the general concept elevation within the reservoir accounts for characteristic changes of the oil and that oil is not uniform in its characteristics throughout the life of the field. Studies of the Weber sandstone reservoir in the Rangely field, Colorado, prove this important fact. Results of this work emphasize the advisability of constant sampling of oil in the reservoir so as to become aware of significant changes in the oil's characteristics.

A COMPREHENSIVE study of the characteristics of the original oil in the Weber sandstone reservoir, Rangely field, Colorado, undertaken by the Bureau of Mines[1] emphasizes the necessity for adequate sampling of a reservoir in order to provide the best possible knowledge of the oil characteristics essential to achieve more accurate reservoir calculations.

The study of the Weber reservoir covered a three-year period concurrent with active development of the reservoir. Data of differential gas liberation, pressure-viscosity, and pressure-volume-temperature relations were obtained for 12 subsurface oil samples. Also, data of reservoir pressure and temperature, composition of liberated or solution gas, composition of 22 produced-gas samples, and Hempel analyses of crude oil somples were noted from 18 wells. The study shows appreciable variation of the characteristics of the oil with elevation and that it is incorrect to assume that the characteristics of oil are constant throughout the reservoir.

Throughout approximately 20 years, since the inception of subsurface sampling of oil reservoirs, extensive use has been made of this means to determine the physical characteristics of reservoir oils, and considerable information derived from these determinations has been reported in the literature. Only in a few instances, however, has consideration been given to possible variance of the characteristics of the oil within reservoirs, and, to the writers' knowledge, sufficient data from which to compare the physical characteristics of oil at various levels within a particular reservoir have not been presented in the literature.

Extensive subsurface sampling in oil fields has not been considered necessary for accurate determinations of the physical characteristics of the reservoir oil, as it has been assumed generally that equilibrium would have been attained in petroleum reservoirs during the great length of elapsed time since the formation and migration of these accumulations, and that the physical characteristics of the contained oil would be essentially constant throughout a reservoir in a state of equilibrium.

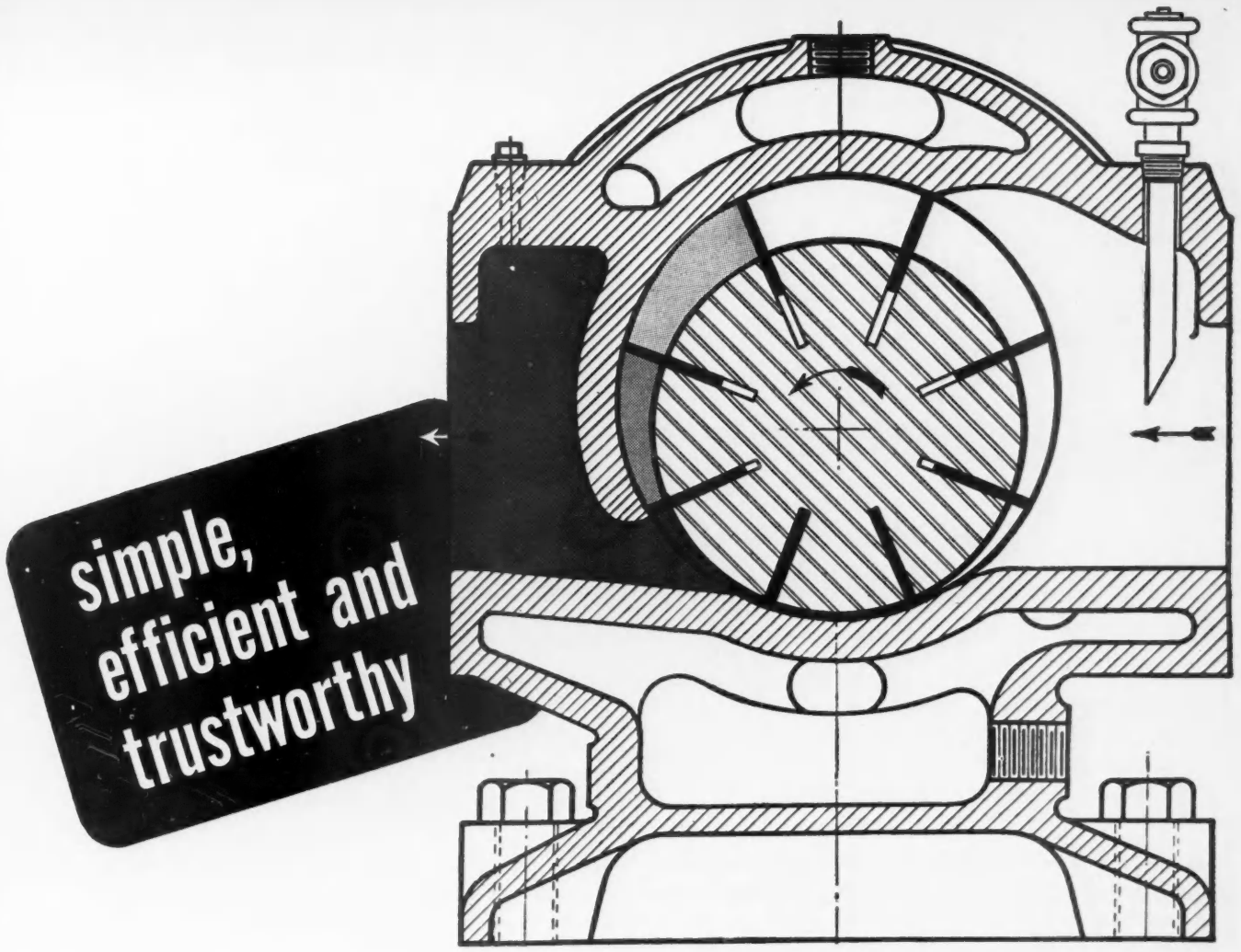
Previous to the study mentioned, an investigation had been made of the characteristics of the oil in the Tensleep sandstone reservoir, Elk Basin field, Wyoming and Montana,[2] which ranks in size with that of the Weber sandstone reservoir at Rangely. It was observed that the oil throughout the Tensleep reservoir was undersaturated originally, and that there was a significant decrease of saturation pressure and solution gas/oil ratio with depth.

The earliest discussions of variation of saturation pressure of a reservoir oil with depth in the reservoir were found in two papers presented before the World Petroleum Congress in London in 1933 by L. A. Pym[3] and Captain D. Comins[4] of Anglo-Iranian Oil Company. Prior to the work of these investigators, reservoir oil was assumed to be saturated with gas at the presure existing at any point in the reservoir. Comins and Pym postulated the theory that the saturation pressure at true solution equilibrium for reservoir oil in contact with an initial gas cap should be constant throughout the whole body of oil and equal to the pressure at the gas-oil interface.

A reservoir in which the saturation pressure of the oil increased with depth in the reservoir (or down-structure) was considered by these investigators to be due to a condition of non-equilibrium between the oil and gas-cap gas. This condition was thought possible only in reservoirs or portions of reservoirs in which the properties of the reservoir rock were such as to prevent re-establishment of solution equilibrium by convection currents. The explanation given for such a condition of non-equilibrium found in the case of the Masjid-i-Sulaiman oil field in Iran shows that reservoir pressure had been lowered owing to seepages from the crest, and that re-establishment of equilibrium in certain portions of the reservoir was prevented due to conditions of poor fluid interconnection.

The following quotations are from Comins and Pym: "It may be assumed that the gas and oil in any reservoir reach complete equilibrium during the course of geological ages, and that the crude becomes saturated at one pressure throughout the system in accordance with Henry's Law of Solubility, namely, that the volume of gas in solution is proportional to the pressure at the gas-oil interface. As erosion and seepages slowly reduce the pressure, processes of convection and diffusion maintain the system in equilibrium in certain areas; in others the fluid interconnection is so poor that these processes are not effective in restoring equilibrium, and the crude remains supersaturated above the true equilibrium state; in such areas gas is not evolved from solution until the hydrostatic pressure falls below the saturation pressure.[5]

"The reason why the crude is, in actual reservoirs, often saturated to higher pressures than the gas pressure is that the crude is often not in true equilibrium with the gas. The reason why it is not in true equilibrium is



the FULLER ROTARY COMPRESSOR

For compressing gas, no reciprocating compressor can compare in simplicity and operation with a rotary.

PRINCIPLE IS SIMPLE

An eccentrically mounted, accurately machined rotor, with integral shaft, is supported on roller bearings in each of the heads. The eccentric rotor mounting leaves a crescent-shaped space, which is divided into compartments by wear-compensating blades. These slide freely in milled slots in the rotor, and are held, pressure tight, against the cylinder solely by centrifugal force. These compartments vary from minimum to maximum on the suction side, and from maximum to minimum on the compression half of the revolution. Properly designed blades, and a wide seal between rotor and bottom of cylinder, assure high and **maintained** volumetric efficiency; the multiple blades minimize pressure differences between compartments and contribute to maximum output with minimum wear.

OPERATION IS EFFICIENT

The Fuller Rotary Compressor assures a smooth flow, with no pulsations ... numerous displacement deliveries per revolution as against one in a single-cylinder piston compressor. Other advantages are: Direct drive; Compact installation; Simple foundations; Maintained capacity and efficiency; and No valves to leak. Because there are few moving parts —rotor, blades, and bearings, **maintenance time and costs are negligible.**

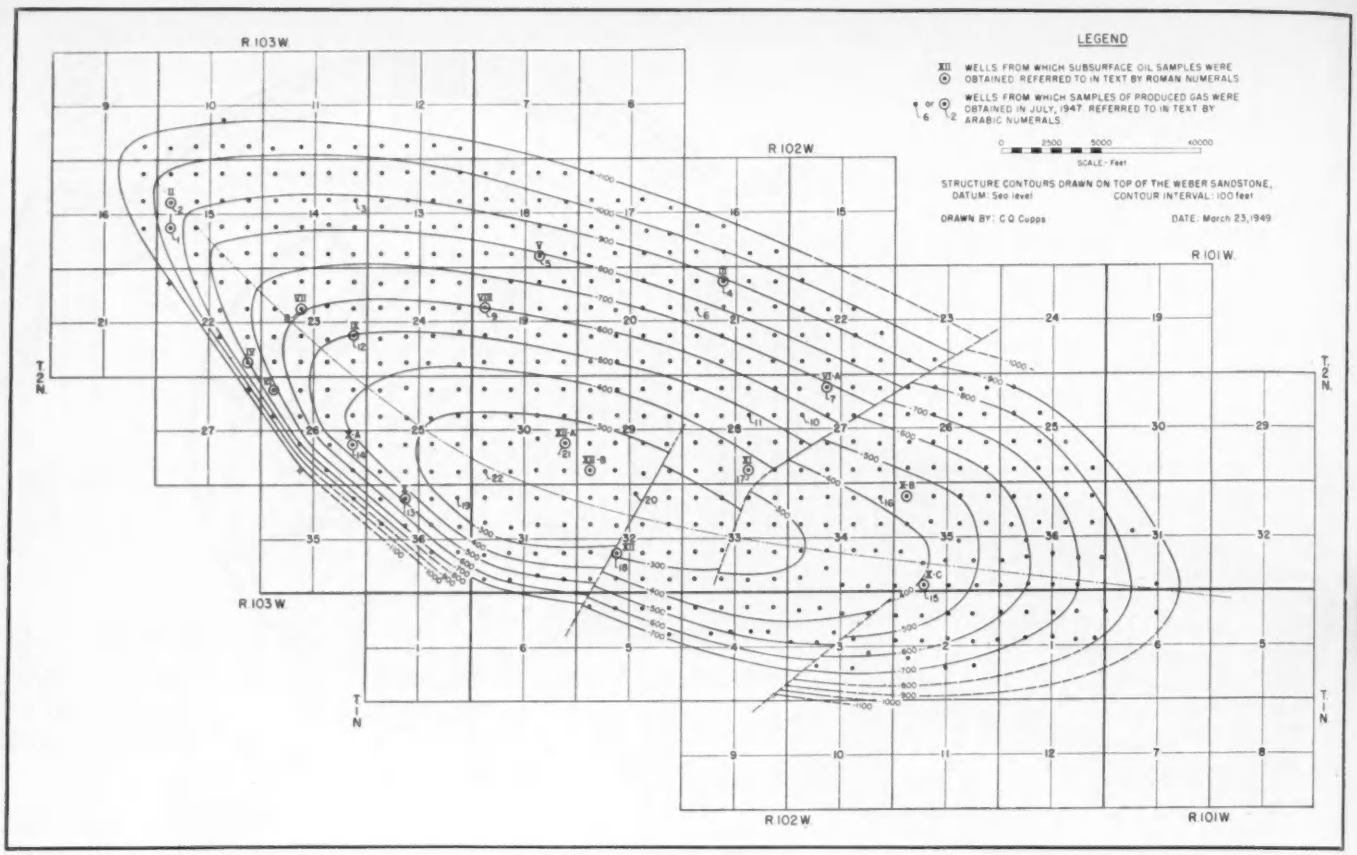
For further information on Fuller Rotary Compressors that will do a better job for you, write for Bulletin C-5.

Fuller

DRY MATERIAL CONVEYING SYSTEMS
AND COOLERS • COMPRESSORS AND VACUUM PUMPS
FEEDERS AND ASSOCIATED EQUIPMENT

FULLER COMPANY
Catasauqua, Pennsylvania
Chicago 3—120 So. LaSalle St.
San Francisco 4—420 Chancery Bldg.

C-218


LEGEND
WELLS FROM WHICH SUBSURFACE OIL SAMPLES WERE OBTAINED. REFERRED TO IN TEXT BY ROMAN NUMERALS.
WELLS FROM WHICH SAMPLES OF PRODUCED GAS WERE OBTAINED IN JULY, 1947. REFERRED TO IN TEXT BY ARABIC NUMERALS.
SCALE - Feet
STRUCTURE CONTOURS DRAWN ON TOP OF THE WEBER SANDSTONE.
DATUM: Sea level
CONTOUR INTERVAL: 100 feet
DRAWN BY: C.Q. Cupps
DATE: March 23, 1949
R.103W.
R.102W.
R.101W.
T.2N.
T.1N.

Structure contour map on top of Weber sandstone, Rangely field, Colorado.

that the diffusion is so low as to be quite inadequate, in human time, for the re-establishment of solution-equilibrium, which has been disturbed by the lowering of the pressure of the superincumbent gas as a result of crude or gas production from the reservoir. Only in reservoirs or in those parts of reservoirs in which conditions of porosity, fissuring, or shattering of the reservoir rock are such as to permit the re-establishment of solution-equilibrium by convection currents will the saturation pressure of the crude at any point correspond to that of the pressure of the superincumbent gas at the date of observation.[6]

"In a unit from which no production has been drawn the following conditions may exist:

"1. The crude may be saturated throughout the oil column at a pressure corresponding to the pressure at the gas-oil level (gas dome pressure). In such cases the gas content of the crude is constant throughout the column.

"2. The crude at any given depth may be saturated to pressures equivalent to, or approaching, the full reservoir pressure at that depth. In such cases the gas content of the crude increases with depth. In this condition, however, there may be a limiting pressure beyond which the gas content of the crude does not increase with depth but remains constant below a certain level in the reservoir. This level is dependent upon the original dome pressure before reduction by seepages from the reservoir."[7]

In 1938, Sage and Lacey[8] reported calculations of the change of composition with depth in a column of hydrocarbon fluid subjected to a uniform gravitational field at conditions of thermodynamic equilibrium. The following quotation is taken from this work:

"The results indicate a progressive decrease in the mole fraction of the components from methane through the butanes with increasing depth, accompanied by a corresponding increase in the amount of the heavier components making up the system. The magnitude of these variations is perhaps insufficient to explain completely the variations in the properties of the liquid phase that are encountered at various elevations within a particular producing horizon. However, the changes are significant, and the treatment presents an example of the application of thermodynamic data to the evaluation of the properties of hydrocarbon fluids under the conditions approaching those encountered in natural reservoirs."

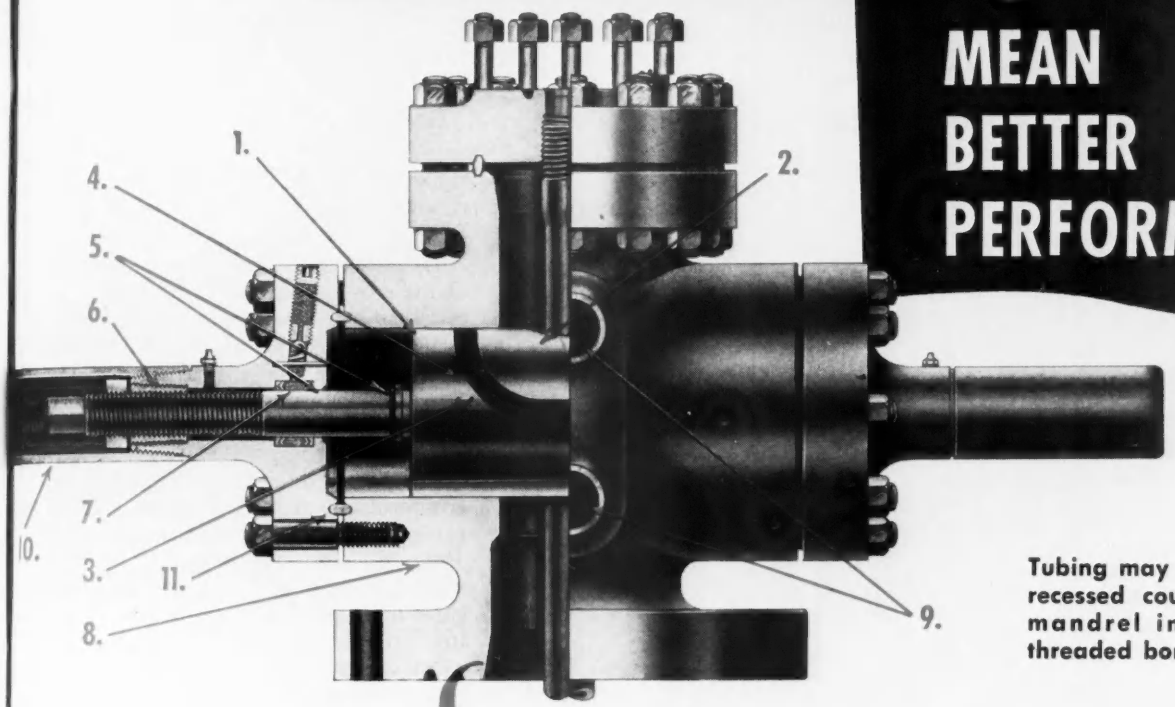
Projecting this hypothesis to terms of saturation pressure distribution in a reservoir, saturation pressure would decrease with depth at conditions of equilibrium due to gravitational concentration of components. Sage and Lacey used equations of free energy for their study that necessitated assumptions of isothermal conditions and ideal solution behavior for the system. They stated, further, that it was their belief the normal increase of temperature with depth found in actual reservoirs would enhance rather than compensate the effects of gravitational concentration.

The study shows the variation of saturation pressure of the original oil in the Weber reservoir to be a decreasing value with depth or down flank of the structure. The decrease in saturation pressure is an appreciable amount and was found to be from 2560 pounds per square inch absolute at the gas-oil contact to 1960 psia at the oil-water contact for a difference in elevation of 840 feet. The original reservoir oil was in contact with a gas cap at the time of discovery of the reservoir.

The decrease of saturation pressure down flank of the structure does

these Points of Superiority

MEAN BETTER PERFORMANCE



Tubing may be suspended from recessed coupling or threaded mandrel in addition to the threaded bonnet as shown.

RECTOR ROUND RAM TUBING HEAD

When installing a ram type tubing head be sure to get these "Points of Superiority" by ordering Rector Type CRS Round Ram Tubing Head. Ask your Rector Representative or authorized supply store.

1. ROUND RAMS. Mud cannot accumulate on top of rams to obstruct their movement. They have greater strength for suspending longer strings of tubing.
2. TWO-PIECE RAMS. Upper front part is separate segment, secured by shoulder screw to remainder of ram. One piece, pre-formed, oil resistant packing is inserted between the two segments. Two-segment ram assures easier movement, because ram packing is not under sealing pressure while ram is being moved.
3. PRESSURE SEALING ELEMENT. Upper ram segments and packing make first contact when rams are closed, forcing packing into pressure-tight seal with ram cylinder and around the tubing.
4. SIMPLIFIED PACKING ARRANGEMENT permits full equalization of pressure on under side and back of rams without ports or by-passes.
5. VALVE SEAT in end flange and valve face on ram screw seat when rams are drawn back to prevent corrosive well fluids from fouling ram screw.
6. THREADED BRONZE BUSHING for ram screw prevents steel-to-steel thread contact . . . assures easy movement of rams even after long standing.
7. PLASTIC PACKING for ram screws, held between "V" retainers, assures pressure-tight seal.
8. STRONGER BODIES with less height are made possible by the round rams.
9. SIDE OUTLETS, either threaded or flanged, are provided above or below the rams or one above and one below.
10. RAM SCREW PROTECTOR can be used when rams are opened or closed.
11. RAM BONNET sealed to body with API ring gasket.

RECTOR WELL EQUIPMENT COMPANY INC

★ MAKING THE OIL INDUSTRY SAFER ★

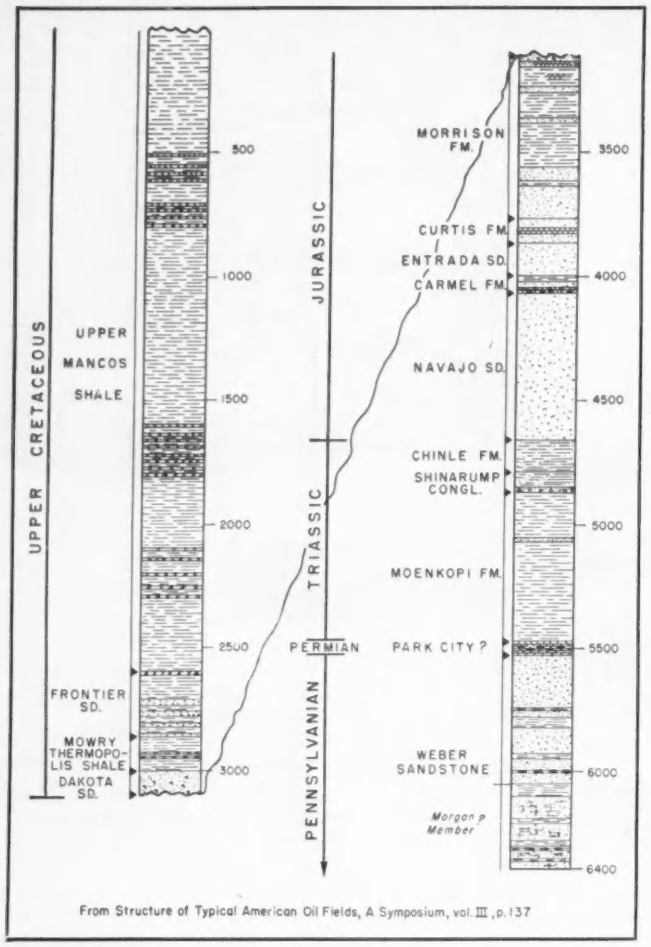
1100 NORTH COMMERCE ST. FORT WORTH, TEXAS

Houston Plant: 2215 Commerce St.

REPRESENTATIVES IN ALL ACTIVE FIELDS

ASSOCIATION OF WELL HEAD EQUIPMENT MANUFACTURERS CERTIFIED

RECTORHEAD RECTOR FULBORE CEMENTING METHOD RECTORSEAL



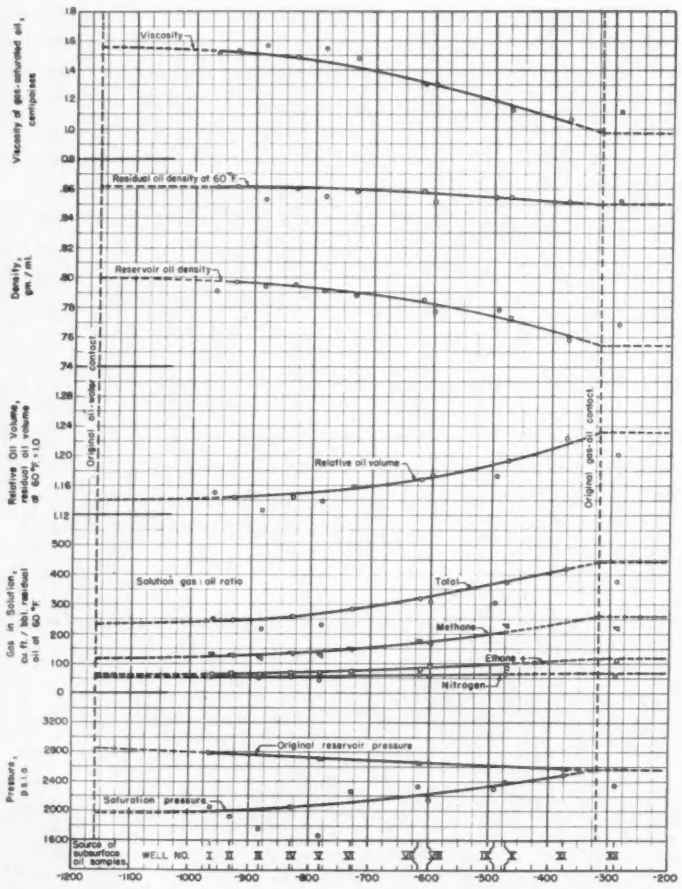
Columnar Section of the Rangely Field, Colorado.

not conform with the ideas of Comins and Pym for equilibrium conditions (constant saturation pressure equal to the gas-oil contact pressure) or with their ideas of nonequilibrium within a reservoir (increasing saturation pressure with depth). The analytical approach of Sage and Lacey, in which gravitational concentration was shown to cause an increase of the heavier components and a corresponding decrease of the lighter components of the oil with depth at equilibrium conditions, more nearly approaches the findings at Rangely.

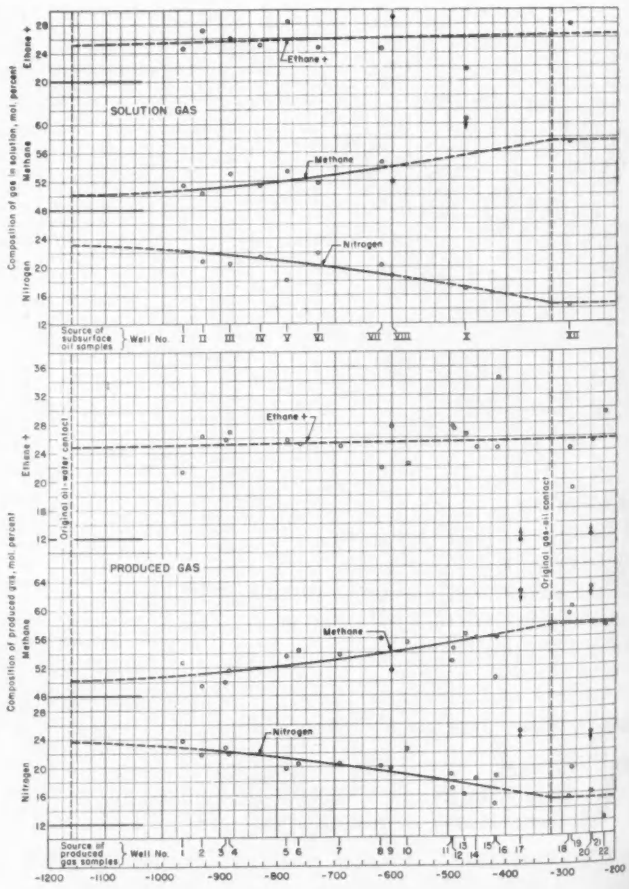
In an attempt to account for the change in properties of the original oil in the Weber reservoir, calculations were made to determine the magnitude of the effect of gravitational concentration of components. The equations developed by Sage and Lacey were used in making the calculations for a system of an average composition of the original Weber reservoir oil at a temperature of 159° F., the approximate average temperature of the reservoir. The results of these calculations are shown in Table 1.

The calculated effect of gravitational concentration of components

■ CONTINUED ON PAGE 205



Characteristics of Weber oil at original reservoir conditions correlated with elevation of top of Weber sandstone, Rangely field, Colorado.


SOLUTION GAS
Ethane +
Methane
Nitrogen
Source of subsurface oil samples
Well No. I II III IV V VI VII VIII X XII
PRODUCED GAS
Original oil-water contact
Original gas-oil contact
Source of produced gas samples
Well No. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

Composition of produced and solution gas correlated with elevation of top of Weber sandstone, Rangely field, Colorado.

Pump Piston and piston rod packings made of neoprene are used in Halliburton pumps for pumping slurry down casings . . . withstand pressures above 6,500 p.s.i. and temperatures over 200°F.

Logging Electrode made by Halliburton Oil Well Cementing Company, spots "pay" formations—locates them exactly, top and bottom. Resilient neoprene is used to protect the electrode housing and as a cable jacket.

Perforating Gun manufactured by Atlas Well Service Corporation, fires shots in a controlled pattern to perforate casings. It has stoppers, gaskets, packing, washers, grommets, cable jacket, and shock absorbers of neoprene.

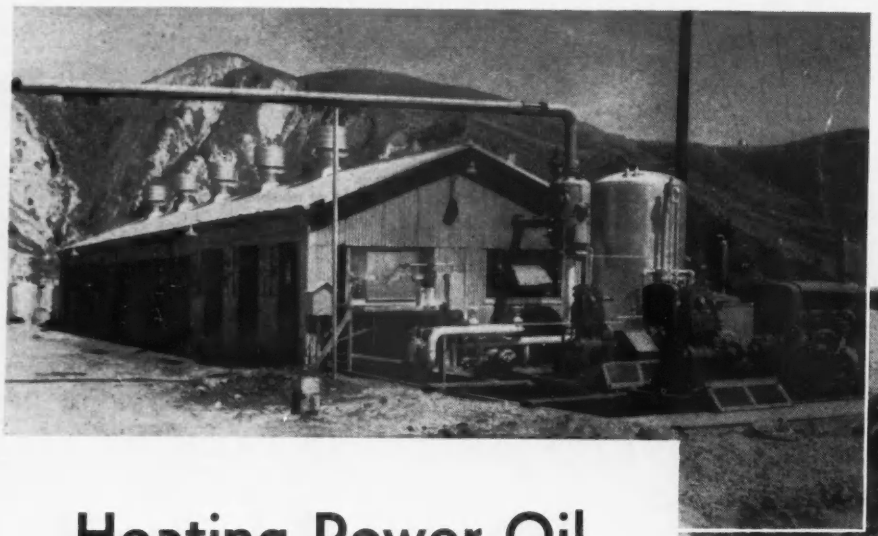
NEOPRENE

The rubber made by Du Pont since 1932

DU PONT

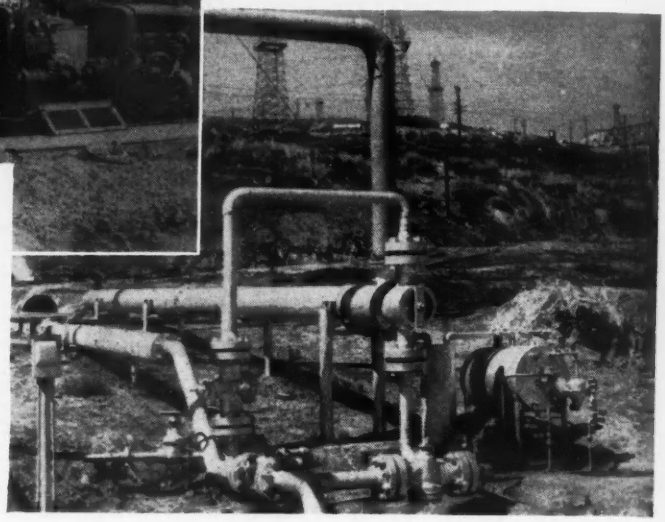
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*



LEFT: Engine and pump building on Tide Water Associated Oil Company's Lloyd lease in the Ventura Avenue field. Two additional units have been placed at the far end of the building where 226° F. vapor phase cooling is employed to heat the power oil.

BELOW: Single shell and tube heat exchanger with condensate receiver set alongside at right. Liquid condensed is pumped back into the jacket water system.



Heating Power Oil in Hydraulic Pumping

A UNIQUE INSTALLATION in Ventura, Calif., is described, wherein the exhaust heat from any number of 11 gas engines is utilized to increase the temperature of the power oil used to hydraulically lift crude production. By employing vapor-phase cooling of the engines driving the hydraulic pumps, a simple heat exchanger made it possible to elevate the temperature of the pumping oil. By heating the power oil, many production problems were overcome and maximum efficiency was obtained from the engines. Pumping problems brought about by paraffin and sludge were virtually eliminated, and the efficiency of the pumping system was held at a maximum. Several items of equipment and their maintenance were eliminated by this method.

HEATING the power oil in a hydraulic pumping system has resulted in increased efficiencies in both engine operation and in pumping a large lease. By utilizing vapor-phase cooling on 11 engines and employing a single shell and tube heat exchanger, temperature of the power oil was increased to more than 170° F.

This method was used by Tide Water Associated Oil Company on its Lloyd lease, just off the Avenue at Ventura, Calif., where 1.5 million British thermal units per hour are recovered from the jacket water of 11 600-cubic inch, six-cylinder gas engines. This amount of heat was put to work to raise the temperature of 187 gallons per minute of 31-gravity API clean power oil. Power developed by the engines, plus the heat recovered from the jacket cooling water, result in an efficiency of 69 to 71 percent.

Engine jacket water was previously processed in a conventional atmospheric cooling tower where the heat absorbed by the jacket water was removed by the cooling tower and wasted to the atmosphere. Heat previously required to raise the temperature of the power oil to 170° F. and above was formerly obtained from standard oil field boilers installed near the heat exchanger. The atmospheric water cooling tower and the boilers have been removed for use elsewhere, resulting in a considerable saving by utilizing vapor phase cooling and employing this additional heat to do the work formerly done by the gas-fired boilers.

The 11 engines connected to the triplex power oil pumping units were originally equipped with conventional individual radiators and air circulating fans. Removal of the fans released a substantial amount of power which can be applied to pumping the power oil to the various wells equipped with this type of lifting device. Cooling the jacket water is now accomplished with equipment known as the vapor phase method where the water in the jackets and throughout the entire water system is held at or above the normal boiling point of good clean cooling water.

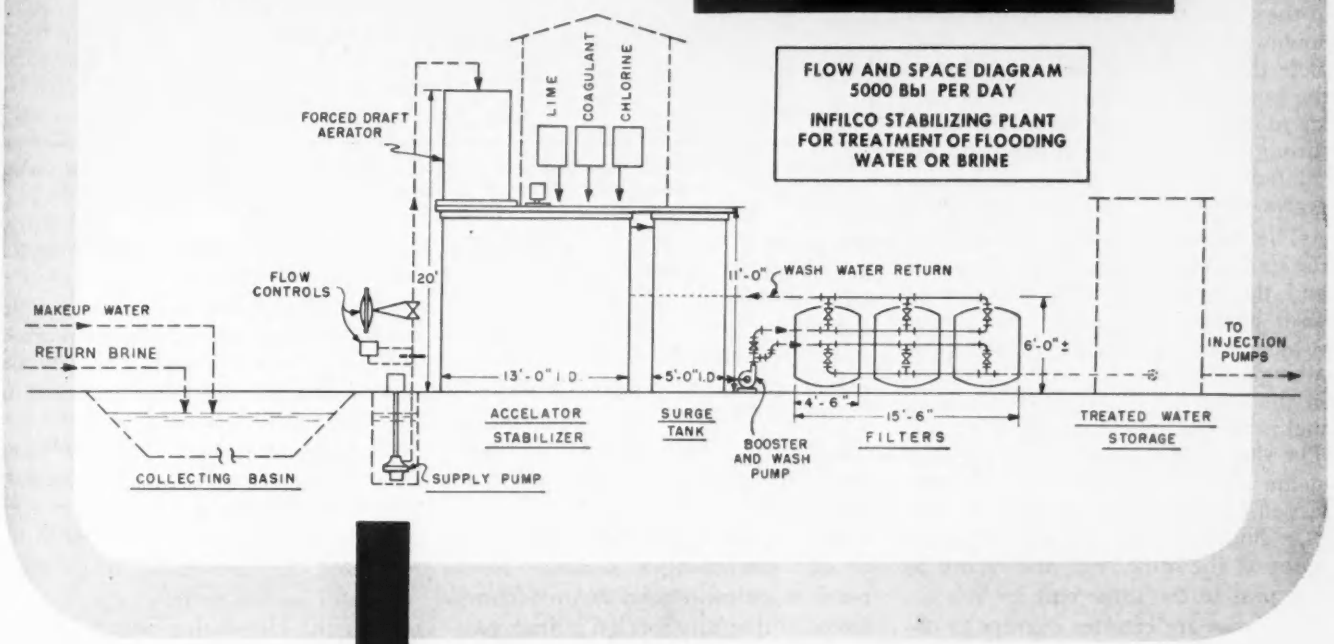
Converting this group of multicylinder gas engines from conventional low temperature jacket cooling includes an entirely different system. The equipment required for this purpose is a small vapor phase unit. It consists essentially of a large drum, mounted on a pedestal about six feet tall, where steam, and/or water vapor are disengaged from the water. It is installed on the outside end of the building and has pipe fittings and connections for a complete circulation system under low pressure and the fluid is never released to the atmos-

no more
FORMATION PLUGGING
for this producer

compact

Infilco

plant delivers clear, stable flooding water



WRITE INFILCO FOR WATER ANALYSIS

No charge for scientific study of your flooding water supply with a prompt, complete report.

PROBLEM—

Plugging of underground formation by flooding water used for secondary oil recovery.

SOLUTION—

Installation of Accelator® stabilizing plant comprising forced draft Aerator, Accelator stabilizer, chemical feeders and controls, and filters.

RESULT—

Compact equipment, easily controlled, effectively clarifies and stabilizes flooding water, makes it non deposit-forming, has ended plugging.

INFILCO
BETTER WATER CONDITIONING AND WASTE TREATMENT SINCE 1894

INFILCO INCORPORATED | *Tucson, Arizona*

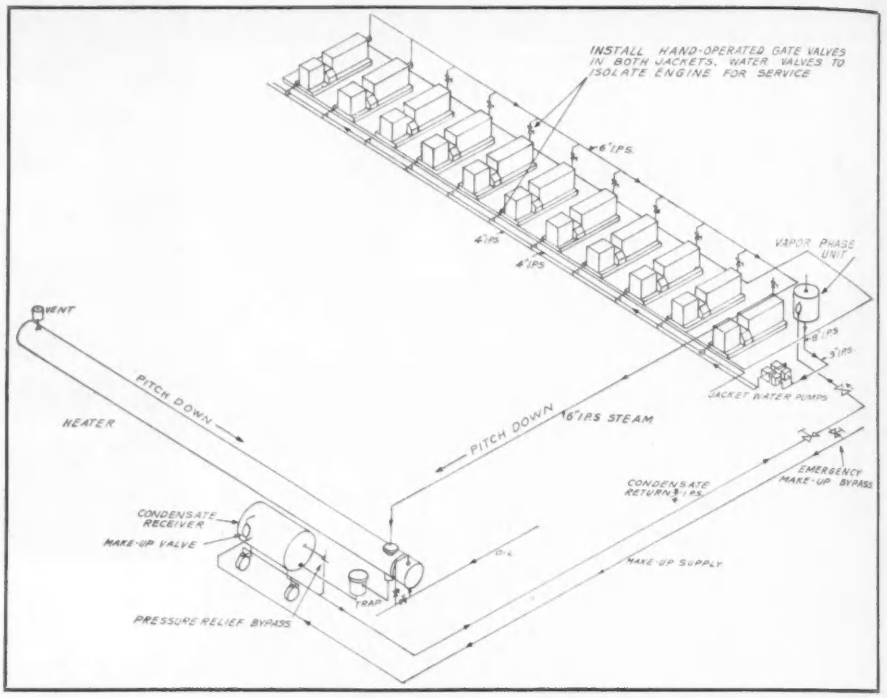
FIELD ENGINEERING OFFICES IN 26 PRINCIPAL CITIES

World's Leading Manufacturers of Water Conditioning and Waste-Treating Equipment

phere. Water to the jackets of the 11 gas engines drops down through the pedestal into a manifold to which is attached two 5-horsepower centrifugal pumps which operate as boosters to return the water to the engines. Each engine has its individual supply line and is equipped with conventional water circulating pumps. The booster pumps are required because of the long return line, and they also prevent vapor lock, or steam flashing in the suction line leading to the conventional water pumps.

Water at a temperature of about 228° F. leaves the water jackets through individual lines connected to an overhead header which is attached with a tangential nozzle to the side of the vapor phase drum. Water flows downward into the pedestal to complete the cycle. Steam disengaged from the hot water passes through an outlet at the top of the unit and flows through a pitched-down overhead insulated line to the power oil heater across the pumproom access road.

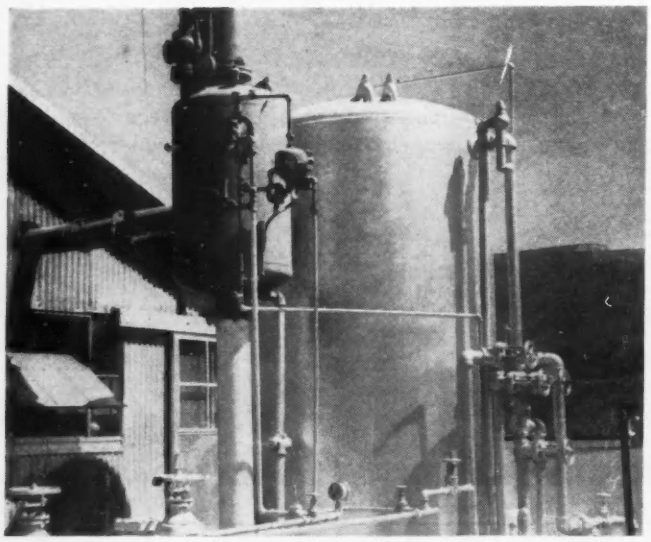
The heat interchanger, in which the steam is condensed again to water, and the power oil at a pressure of 3200 pounds per square inch gauge is heated to a point above 170° F, is a single shell and tube unit mounted in the open on pipe cradles. It is 12 inches in diameter and 40 feet long. The shell is designed to operate with steam at 250 psig, and the tubes designed for a working pressure of 3500 psig. Both the power oil and the steam enter at the same end, and return at one pass to the same end for release. Both flows are counter current to obtain the maximum interchange of temperature between the two fluids.

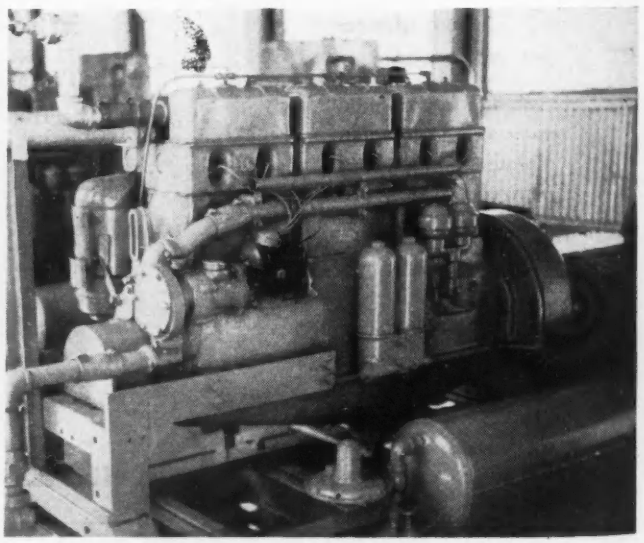


Schematic layout of Lloyd lease hydraulic pumping station, showing engine jacket water cooling system and connection of power oil to heat exchanger.

Oil at or above 170° F. passes into a header which distributes the oil to the individual wells being operated in the immediate locality. Steam, condensed again to liquid, flows into a condensate receiver from which it is pumped automatically back into the circulating system with a one-fourth horsepower motor-driven centrifugal pump operated on a float control. A sediment drum is set between the outlet of the interchanger and the liquid receiver, or condensed steam accumulator, so that any foreign matter passing from the shell of the heating unit may be blown from the system instead of being pumped back into the jacket water system.

The vapor phase unit, which is the steam disengaging drum, contains a low water level alarm to notify the operator of a deficiency of water, a liquid level instrument connected into a make-up system containing softened water for the jackets, a high-pressure relief valve, and a vacuum breaker. A sight gauge glass is provided so the operator can determine the quantity of water in the system. The level at which the circulating water is maintained in the system is always just below the outlet of the tangential





LEFT: Vapor phase unit on pedestal at end of engine and pump building. Steam is disengaged from the hot water in this small unit, which is equipped with adequate controls and warning devices. Large tank at right is water softener for makeup water.

RIGHT: One of 11 gas fueled, 600-cubic inch engines showing conventional water pump circulating hot water in the jackets, which are maintained at 226° F.

nipple attached to the side of the unit so that steam can be disengaged quickly from the stream of water, in order that bubbles will not be trapped and return to the booster pumps and the jackets of the power units. If the amount of water in the system should drop below a predetermined level, the warning horn is sounded, and in a short time thereafter, if the level is not raised, magneto shorting equipment comes into play to shut down the entire installation.

Since heat rejected by the engines to the jacket water is employed to raise the temperature of the power oil, consumption of fuel in conventional boilers or tubular direct fired heaters is not necessary. As the water is in a closed system, no loss is encountered except through mechanical leaks. Therefore, only a relatively small volume of water is required and loss to the air through conventional atmospheric cooling is avoided. Exhaustive tests on such equipment reveal that the full length of the cylinders are at the same temperature so that temperature taper is not present. Pistons pass up and down through a barrel with the same diameter at the skirt as at the top; hence rings are not flexed such as would be the case when any degree of taper is present.

It was discovered that the temperature is high enough in the cylinders, jackets and the cranckcases of these engines, that products of combustion do not condense. Acid gases produced by combustion pass out with the exhaust, or they are removed from the cranckcase through the breather pipes before they have an opportunity to contaminate the lubricating oil. Oil tested frequently by an independent laboratory was found to retain its lubricating qualities over an extended period of time and was free from sludge and deleterious compounds. If, for any reason, any one or more of the power units is shut down, the same temperature is maintained while idle as when in full operation. Therefore, the engine is hot and ready for a full load immediately without waiting for the customary elapse of time until a certain temperature is attained on the jacket water. When an engine is to be serviced, or repaired, mechanics report that one with a temperature of 226° F. is no more uncomfortable to handle than one with a temperature of 170° F. Either machine must be cooled before it is dismantled.

As for the temperature on the power oil, that point remains constant whether all 11 engines are operating, or only one is on the line. Since each engine has a definite output of heat rejected to the jacket water, and each triplex pump handles a definite volume of oil, the ratio of heat to oil is always equal, and steam condensing is always in direct proportion to the volume of oil handled.

The installation described above has resulted in the saving of boilers, atmospheric cooling towers and engine radiators, in addition to reducing the maintenance problem of these pieces of equipment. By elevating the temperature of the engines, greater efficiency has resulted, and many advantages gained in heating the power oil used to hydraulically pump this entire lease.

Oil Characteristics

■ CONTINUED FROM PAGE 196

accounts for a very small percentage of the total change in composition of the original reservoir oil with depth. That portion of the total change in composition with depth not accounted for by gravitational concentration might indicate that a condition of nonequilibrium existed in the Weber reservoir at the time of discovery. Should the reservoir temperature gradient, 11° F. in 840 feet, account for the remainder of the total change in composition with depth, then the effect of increasing reservoir temperature with depth would not only enhance but would greatly exceed the effect of gravitational concentration of components.

There is uncertainty in the calculations of the effect of gravitational concentration upon the composition of the reservoir oil, as the temperature-depth gradient in the reservoir was not taken into account, due to the assumption of isothermal conditions required for the calculations. Another uncertainty is caused by the assumption of ideal solution behavior in the derivation of the equations used to calculate the effect of gravitational concentration. Additional uncertainty enters the reported calculations owing to the use of values of partial molal volume for each hydrocarbon component of the reservoir oil. These values were taken from correlations based on average molecular weight of the system.[9] Such correlations do not account for the effect of nitrogen in solution in the reservoir oil on the values of the partial molal volumes. To the knowledge of the writers, such information is not available in the literature at present.

To conclude that a condition of equilibrium did not exist originally in the Weber reservoir possibly would be premature because of these uncertainties in the calculations. It is shown, however, that the change in composition of the reservoir oil with depth is considerably greater than can be accounted for by data at present available in the literature and by present concepts of equilibria in petroleum reservoirs.

The magnitude of decrease of saturation pressure with depth in the Weber reservoir emphasizes the fallacy of assuming constant saturation pressure and, consequently constant reservoir-oil characteristics for an entire reservoir just because of the presence of an initial gas cap. The variance of saturation pressure with depth, as found in the Weber reservoir, also indicates the need of sample data from many parts of a reservoir in order to determine properly the reservoir-oil characteristics used for reservoir engineering calculations.

REFERENCES

[1] Cecil Q. Cupps, Philip H. Lipstate Jr., and Joseph Fry: "Variance in Characteristics of the Oil in the Weber Sandstone Reservoir, Rangely Field, Colo." Bureau of Mines, Report of Investigations 4761. (Copies may be obtained by writing to the U. S. Department of the Interior, Bureau of Mines, Washington 25, D. C.)

[2] Ralph H. Espach and Joseph Fry: "Variable Characteristics of the Oil in the Tensleep Sandstone Reservoir, Elk Basin Field, Wyo. and Mont." Bureau of Mines, Report of Investigations 4768.

[3] L. A. Pym, "The Measurement of Gas-Oil Ratios and Saturation Pressures and Their Interpretation," World Petroleum Congress Proceedings, London, Vol. 1, 1933, pp. 452-457.

[4] Capt. D. Comins, "Gas Saturation Pressure of Crude Under Reservoir Conditions as a Factor in the Efficient Operation of Oilfields," World Petroleum Congress Proceedings, London, Vol. 1, 1933, pp. 458-466.

[5] See p. 457 of work cited in Ref. 3.

[6] See p. 459 of work cited in Ref. 4.

[7] See pp. 456-457 of work cited in Ref. 3.

[8] B. H. Sage and W. N. Lacey: "Gravitational Concentration Gradients in Static Columns of Hydrocarbon Fluids," Petroleum Technology, T.P. 1004. November, 1938, 12 pp.

[9] B. H. Sage, B. L. Hicks and W. N. Lacey: "Partial Volumetric Behavior of the Lighter Hydrocarbons in the Liquid Phase," API Drilling and Production Practice, 1938, pp. 410-415.

TABLE I

Composition[1] as a function of depth, based on subsurface oil samples from the Weber sandstone reservoir, Rangely oil field, Colorado

Depth, Feet[2]	Average Temperature, °F.	Butanes and Lighter, Mol Percent Liquid	Pentanes and Heavier, Mol Percent Liquid
0	153	44.29	55.71
840	164	30.57	69.43
Change: 840	11	−13.72	+13.72

[1] Composition of reservoir oil based on differential gas-liberation data, using composition and quantity of solution gas and quantity of residual oil with the assumption that residual oil was heptanes and heavier.

[2] Measured from gas-oil interface.

Composition as a function of depth, based on calculated effect of gravitational concentration of components at 159° F. for the Weber-sandstone reservoir oil, Rangely oil field, Colorado

Depth, Feet[1]	Butanes and Lighter, Mol Percent Liquid	Pentanes and Heavier, Mol Percent Liquid
0	44.29	55.71
840	43.35	56.65
Change: 840	−0.94	+0.94

[1] Measured from gas-oil interface.

Oil Men at Midland Debate:

Spraberry a Siltstone?

ONE of the largest groups of oil men ever assembled to discuss one oil field jammed the Midland, Texas, high school auditorium October 19-20 to participate in a symposium on the Spraberry trend fields of West Texas. More than 650 registered and perhaps 1000 were in attendance at the two-day session sponsored by the Texas Petroleum Research Committee.

William J. Murray, Jr., member of the Texas Railroad Commission, sounded a keynote of the meeting. He pointed out that there were considerable differences of opinion as to the methods of drilling and completing Spraberry wells, and that no one could even hazard a guess as to reservoir performance or proper conservation techniques. He urged that the best brains in the industry analyze the Spraberry reservoir and determine what, if any, conservation techniques could be devised to improve the necessarily small percentage recovery.

That much is yet to be learned about the Spraberry was brought out in the first few papers presented. It had been generally held that the Spraberry was a sandstone, but it was soon pointed out that it was not a sand at all; it was a siltstone. Later, the statement was made that it was a sand. It was also stated during the symposium that (1) oil production came from the sand; (2) it didn't come from the sand but from the shale; and also (3) possibly it didn't come from either, but could have migrated through the fractures.

Dr. George Fancher, director of the Texas Petroleum Research Committee, pointed out how huge the Spraberry appeared, and that in spite of its apparent low recoveries it has a large potential recoverable oil reserve.

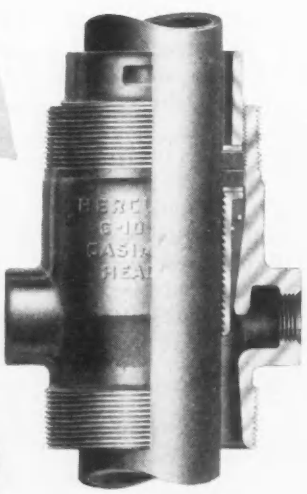
Papers presented covered subjects from "History and Development" to "Completion Methods." Wm. Osborn, El Capitan Oil Company, Midland, discussed the "History and Development of the Spraberry," reviewing the trend development from the beginning to its present stage. He brought out that this development has produced one of the most controversial oil fields in the world. He stated that operators are divided into two classes: (1) enthusiastic—those having acreage in the trend, and (2) disinterested—those not having acreage. In his opinion, the optimism displayed by some operators is due either to the possession of more data and initiative or wishful thinking; however, it is improbable that so many business men and bankers would put so much money behind this development without good reason.

Siltstone Formation

J. H. Bartley, consulting geologist, Midland, discussed the "Stratigraphy and Structure" of the Spraberry, giving the general geology of the trend. He said the Spraberry was not really a sand, but rather a siltstone. He also stated that the use of Spraberry and Dean has been accepted as proper nomeclature through the efforts of Lamar McLennan and Waring Bradley. Illustrations showed areal extent, typical logs, cross-sections, etc., each

STANDARD of the INDUSTRY...

"Originators of overhead-packed wellhead equipment"



The next time you order, be sure to specify HERCULES G-10 CASING HEADS—standard of the industry for 26 years. Made from electric cast steel, with overhead packing arrangement and built to stand 3,000 pounds test pressure. Steps are provided to support from 2" tubing up to and including 7" casing. Will safely support 10,000 feet of 7" O.D. Casing.

Write for Bulletin No. 310-G10

SOLD AT ALL SUPPLY STORES

HERCULES TOOL COMPANY

Manufacturers of Oil Field Equipment

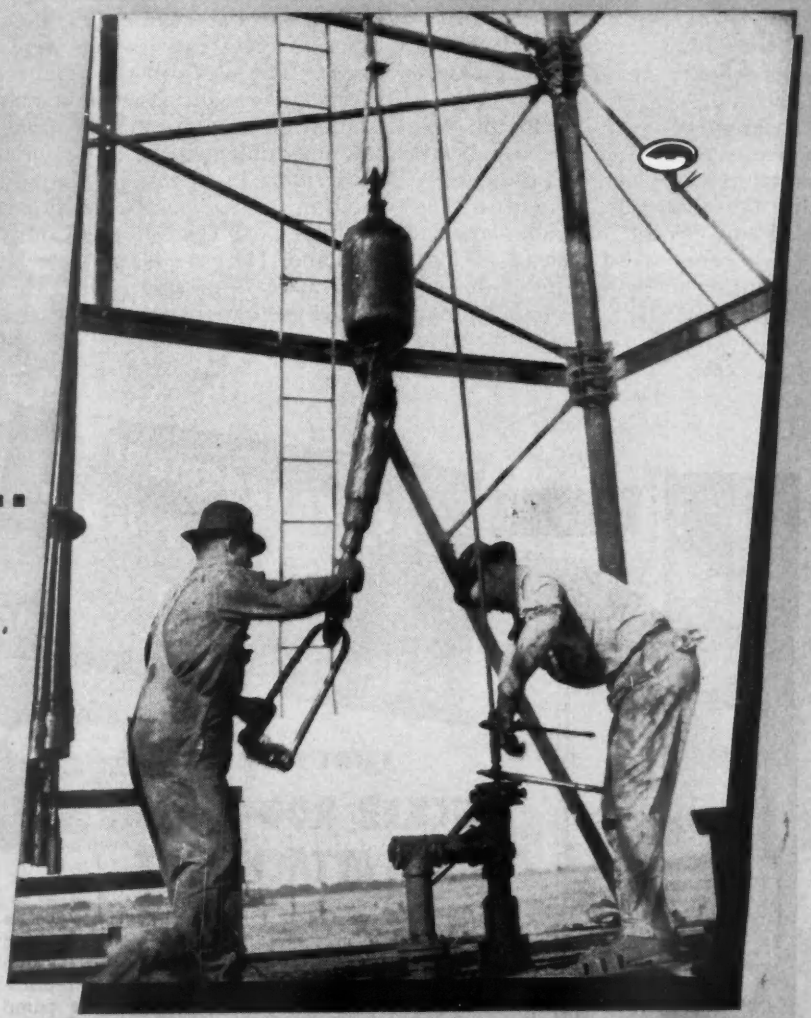
General Office and Plant: 17th and Phoenix P. O. Box 286 — TULSA, OKLAHOMA — Telephone 3-1186 Cable Address "HERTOCO"

EXPORT REPRESENTATIVES: OIL FIELD EQUIPMENT CO., INC. T. E. WARD, President 30 Church St., New York 7, N. Y.

POINT NO. 2

EVERY JONES SUCKER ROD...

is a quality product. A comparison of threads and make-up spotlights the outstanding superiority of the *Jones Joint.*



LOOK FOR THE GREEN RODS!

JONES

SUCKER RODS

Best in the Field!

THE S. M. JONES COMPANY
Division of Buffalo-Eclipse Corporation
General Office and Factory: TOLEDO, OHIO
Sales Office: Kennedy Building, Tulsa, Okla.
Export Sales Office: Buffalo International Corp.
50 Church Street, N. Y. C.

of which Bartley discussed in detail. He explained the effect of deep-seated Pennsylvanian structures on the Upper Spraberry beds. The normal structures are broad regional west-plunging nonoclinal noses of minimum closure, he said.

"Relation of Fractures to the Accumulation of Oil in the Spraberry Formation" by George Gibson, Seaboard Oil Company, Midland, revealed how electric and radio-activity logs are being used instead of logs from cutting analysis. This is due to the ease with which mechanical logs can be employed and also to the time saved. He gave proper description of the massive shale, black-bedded shale, and the siltstone (or sandstone) including an analysis of each. Fractures found in cores and cuttings were discussed. The author theorizes that shrinkage brought about by re-crystallization or metamorphism caused the fractures that exist in this reservoir.

"Drilling Problems and Casing Program in the Spraberry" was presented by John Cox, Texas Crude Company, Midland. He gave a complete report of drilling Spraberry wells. He discussed the various practices that have been developed relative to drilling, lost circulation problems, and casing programs.

"Mud Programs for Spraberry Trend Drilling" by W. S. Howe, Permian Mud Service, Inc., Midland, illustrated in detail the mud control being used in the various areas of the trend under the several casing programs being followed. The most difficult problem which arises is loss of circulation. As a general rule, this problem can be minimized by reducing the weight and by using small concentrations of fibrous materials. The control is much easier where a full salt string is used. This is due to not having a high salt content in the mud which reduces weight. Varying amounts of crude oil are often used to lighten the weight.

"Radioactivity Logs Define Lithology in the Spraberry Formation" by Jack P. Myers, Lane-Wells Company, Midland, and E. S. Mardock, Well Surveys, Inc., Tulsa, included a very interesting, illustrated, discussion on radioactivity logs. According to the authors, the lithologic conditions prevailing in the Spraberry formation of West Texas necessitates a log giving maximum detail. The well completion practices are such that the instrument must be capable of logging in oil or oil base mud. It is also desirable to have a log indicating the productive porosity. W. J. Lytle, Jr., of Schlumberger Well Surveying Corporation discussed Induction and Gamma Ray Logging and pointed out the excellent detail obtained. His observation has been that fracturing cannot be evaluated from the logs and also that there are no abrupt formation changes in the Spraberry Trend as in other areas.

Core Data

"Core Data Discussions" by Vic Ogden, Core Laboratories, Inc., Midland, and Jack Locke, Rotary Engineering Laboratories, Midland, was a paper dealing with properties of the reservoir rock as related to productive capability of the reservoir and the storage capacity of the formations penetrated.

"Reservoir Fluid Properties" and "Reservoir Performance" were discussed by Ray Brack, The Ohio Oil Company, Midland. He presented statistics and data on the Spraberry reservoir, noting the similarity of the physical properties of samples taken from various Spraberry areas. A general review of the bottom-hole pressures, gas-oil ratios and other related data was made for all fields producing from the Spraberry.

"Unique Reservoir Characteristics

THAT'S THE PAGE

SUCKER ROD ON and OFF ATTACHMENT

The Page On & Off Attachment provides a quick, effective means of joining sucker rods to the pump plunger in tubing and casing pump installations. Its proven design permits removal and replacement of sucker rods without disturbing the pump plunger—a foolproof clutch-type locking mechanism eliminates chance for failure even under the severest of pumping conditions.

The success of the Page On & Off Attachment has prompted many operators to switch to larger volume pumps. The result—immediate payout for the changeover through increased production.

SIMPLE CONSTRUCTION—SIMPLE OPERATION!

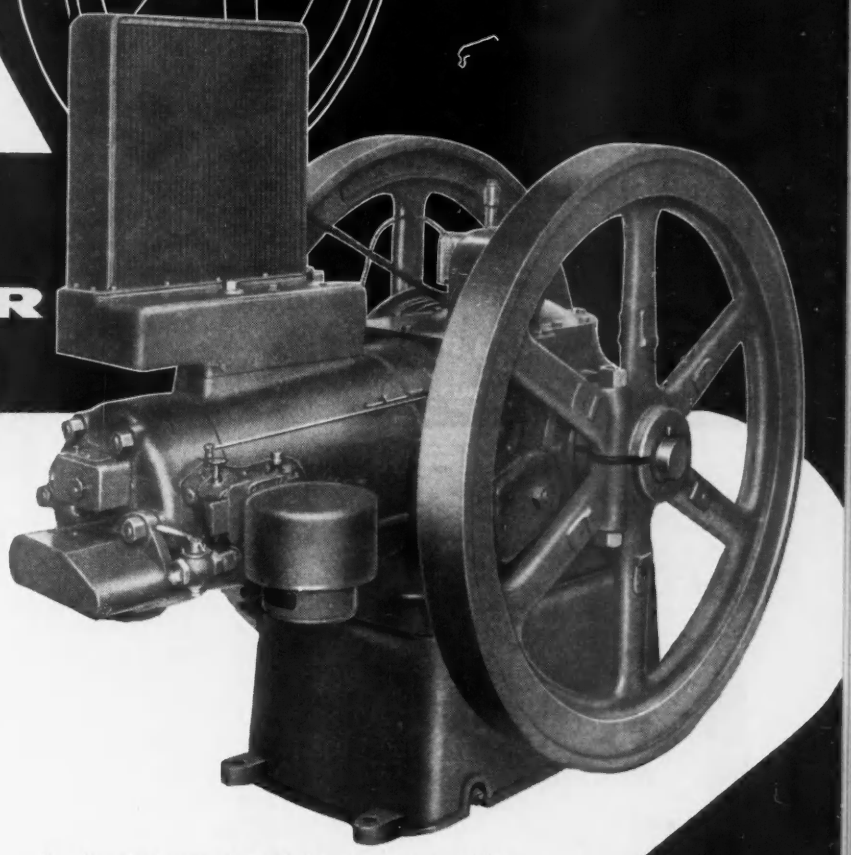
Simplicity of construction is the keynote of the Page On & Off Attachment. There are no threads to gall, no complex mechanism to foul up. The tool consists of a male and female section which interfit and interlock when the sucker rods are lowered onto the pump plunger. A ¼ turn left rotates shoulders on the male section into milled out slots in the female section. During rotation a locking clutch engages by force of a helical spring positioned below it.

Disengagement of the tool requires only slight up strain and a ¼ turn right. This forces the clutching sleeve down and permits rotation of the female section for disengagement from the male section. Both the male and female sections are milled and turned from solid billits of steel and are held to close tolerances to virtually eliminate chance for wear.

SEE OUR CATALOG
IN THE COMPOSITE CATALOG

Mid-Continent Distributors
D+B Division—Emsco Derrick & Equipment Co.,
Garland, Texas
The Continental Supply Company
Dallas, Texas

THIS BALANCE ...IS IN YOUR FAVOR



An outstanding performance advantage of the Fairbanks-Morse "ZC" is the *balanced* power output you get with the TWO big flywheels located between the engine and the pumping gear unit. And with TWO flywheels, you can drive from either side of the engine.

Load fluctuations are "smoothed out" by the properly proportioned flywheels, while the power of the engine remains constant. The flywheels store excess energy on the down stroke of the rods . . . then use this stored energy to equalize the load at the peak demand of the up stroke. You not only get smoother pumping . . . you protect engine and driven equipment against overload and abuse.

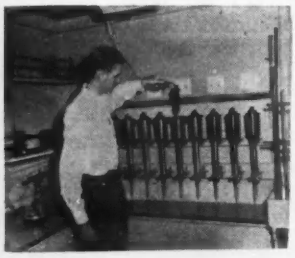
For the complete story on the "ZC," and the broad range of sizes, see your local supply store or write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.

Two flywheels mean better balance . . . more stability on the mounting pedestal. No chance with a "ZC" for unbalanced flywheel effect to cause the engine to work loose from its mounting.

FAIRBANKS-MORSE,

a name worth remembering

OIL FIELD EQUIPMENT • PUMPS • SCALES • ELECTRIC MOTORS • GENERATORS • LIGHT PLANTS • DIESEL, DUAL FUEL AND GASOLINE ENGINES • MAGNETOS • DIESEL LOCOMOTIVES

SECONDARY MODERN RECOVERY
TECHNICAL CONSULTING
PRODUCTION ENGINEERING
SERVICE, INCLUDING
CORE ANALYSIS
PRESSURE MAINTENANCE WITH GAS OR WATER
REPRESSURING WITH GAS OR WATER
Retort
Inspection

Our Core Analysis
Laboratory
SURVEYS
ESTIMATES
DESIGN
INSTALLATION
SUPERVISION
PETROLEUM ENGINEERS
CABLE & STAPLES
WICHITA FALLS, TEXAS

When You Need
Efficiency in Swabbing

YOU CAN DEPEND
ON BELL SWABS
Whether swabbing
. . . oil
. . . water
. . . or mud . . .
you can depend on
BELL'S DESIGN and
QUALITY for
MAXIMUM
RECOVERY

BELL RUBBER COMPANY
• Phone EDgemont 2-1281
• 6001 W. Jefferson
• P. O. Box 4426
• DALLAS 11, TEXAS

Discussion" by Ralph Fitting, Fitting and Jones, Midland; Lincoln F. Elkins, Sohio Petroleum Company, Oklahoma City; E. Charles Patton, Magnolia Petroleum Company, Dallas; and W. O. Keller, Keller and Peterson, Midland, was a more technical paper, by comparison. It dealt with the possible effects of the physical properties and geometry of matrix Spraberry producing sand and the fracture systems upon the flowing mechanism. The discussions explored the possible abnormalities in reservoir performance that may result from the unique characteristics of the Spraberry Trend reservoirs.

Dr. Harold N. Fisk, Humble Oil & Refining Company, Houston, described "Jointing in the Spraberry." Dr. Fisk illustrated his talk with colored slides which exhibited jointing and/or fracturing usually found at the surface. During the course of his paper these surface observations were gradually correlated with his findings as to the Spraberry formation.

"Introduction to Spraberry Sand Completion Methods" by Harry E. Legendre, Consulting Engineer, Midland, was a preliminary discussion of completion practices being used below the casing shoe.

"Hydrafrac Operations in the Spraberry" by Waldo L. Grossman, Halliburton Oil Well Cementing Company, Midland, reviewed the development history of the Spraberry Trend as compared to that of the formation fracturing process. He explained the various methods being used to effect this type completion.

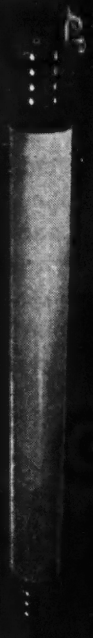
"Acid Flushing of Fractures in the Spraberry Sand" by Brance Bristol, Jr., The Western Company, Midland, showed how acid is used in Spraberry operations.

"A New Spraberry Completion Technique" was prepared by J. C. McCormick, Dowell Incorporated, Tulsa, and Jack Moore, Dowell Incorporated, Midland. A method, originated in Dowell's laboratory was explained as a new type acid-kerosene gelling agent used to open the fractures and place sand for a propping agent. The advantages of this method are that it cleanses the formation during the treatment, and that it is possible to put the well on production immediately after the treatment.

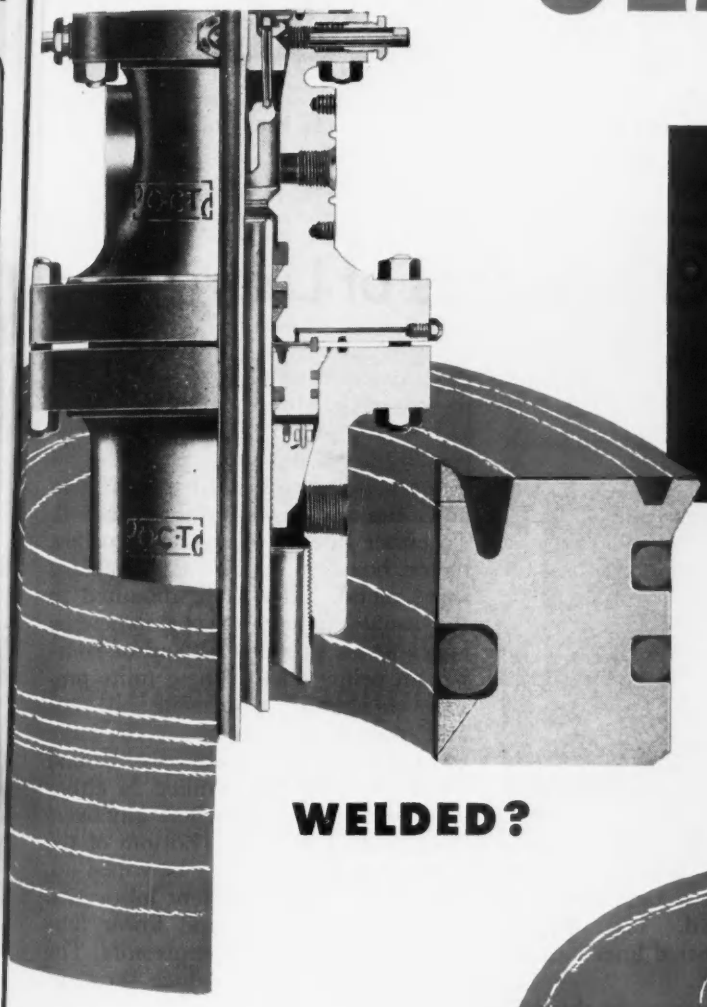
"Air Drilling of the Spraberry Sands" by O. H. Berry, Jr., and Bill Quesenbury, Wilshire Oil Company, Inc., Midland, described the mechanics of drilling in Spraberry wells using compressed air as a circulating fluid.

Proved!
BY 14 YEARS USE
BY THE INDUSTRY

You're sure of leak-proof tubing couplings when you make them up with Rectorseal. The same is true about connections on your rig lines . . . mud, water, steam, diesel fuel, gas . . . your separator and tank battery lines.
For 14 years Rectorseal has been meeting the industry's need for a thread sealant that holds all petroleum solvents; that is economical, easy to apply; that won't freeze the connections; that is positively and permanently leak-proof.
Ask for RECTORSEAL AT YOUR SUPPLY STORE!
or write RECTORSEAL, Dept. G
2215 Commerce St., Houston 2, Texas
RECTORSEAL
Manufactured by
RECTOR WELL EQUIPMENT CO., INC.
Fort Worth, Texas
MAKING THE OIL INDUSTRY SAFER

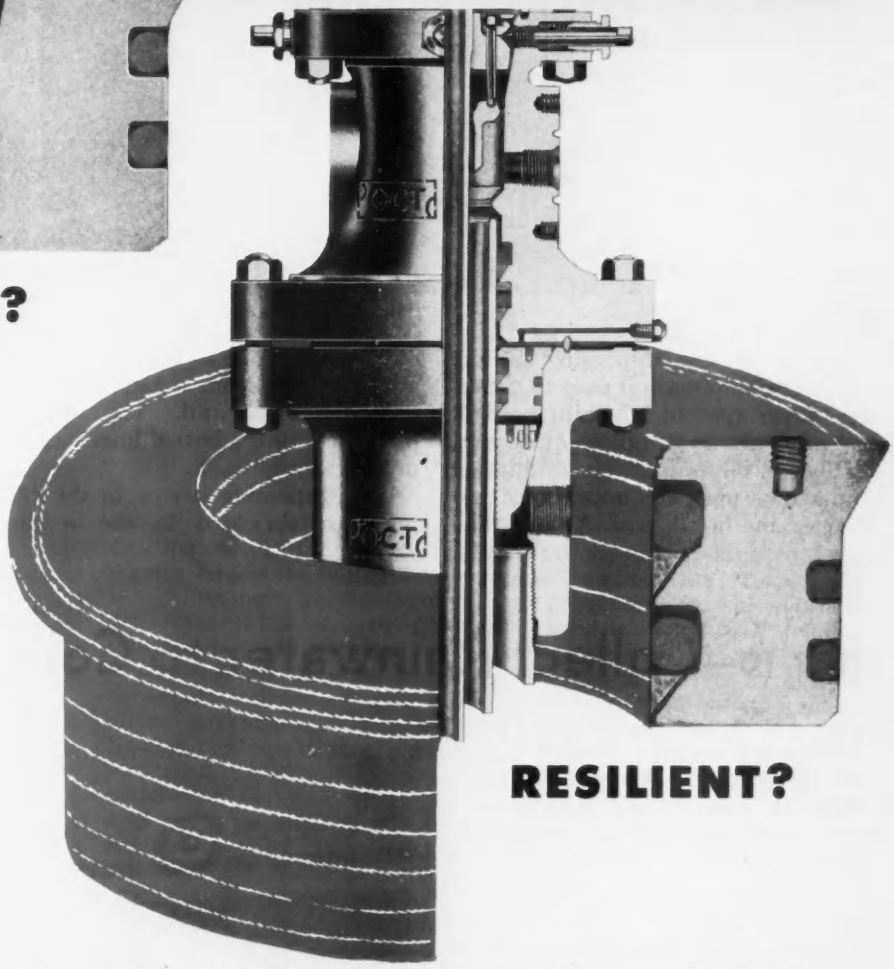
PARELEX
Electric
Heaters
for
Oil Wells

Bottom Hole
Tubing
and
Flowline
Heaters
for Paraffin
and
Heavy Crude
Model BH3
Write for Details
PARELEX CORPORATION
P. O. Box 552
HOUSTON 1, TEXAS

Which type of SEAL *do you prefer?*



WELDED?

O-C-T *has the answer!*



RESILIENT?

Yes, the O-C-T "C-18" series... an advanced design casing head engineered to meet definite field needs and save the industry time and money . . . brings new simplicity and flexibility to the low price, high pressure head field along with an extra margin of safety and ease of installation.

The "C-18-H" model features an automatic floating seal. This seal uses the application of oversize Hycar "O" rings on the outside and inside of the hanger backed up by non-extrusion rings to automatically seal off any pressure in the annular space between the pipe and the I. D. of the casing head.

The "C-18-HW" provides a metal to metal seal. A restricted API metal ring gasket between the welded element and the next head exerts the correct pressure on the ground seat of the casing head to form a perfect metal to metal seal. The "O" ring on the inside diameter of the welding element and below the weld acts as a secondary seal, providing added protection while the weld is being applied.

Both models of the O-C-T "C-18" series give you an economical, dependable hanger, and bring important new features of safety and ease of installation.

So, whatever your choice of wellhead seal, O-C-T has the answer. Talk to your O-C-T Representative or write for complete engineering details.

O-C-T PRODUCTS — dependable and available through more than 700 supply store locations.

Oil Center Tool Co.

P. O. BOX 3091 • HOUSTON, TEXAS

Export Representatives: Sterling Areas—Le Grand, Sutcliff & Gell, Ltd., Southall, Middlesex, England. Address Export Inquiries for **All Other Countries** to P. O. Box 3091, Houston 1, Texas.

How to do it!

PRODUCTION HINTS

$10 is paid for each illustrated acceptable contribution. Mail to The Editor, WORLD OIL, P. O. Box 2608, Houston 1, Texas.

HOW TO—Maintain Convenient Supplies of Lubricants

Where it is necessary to have on hand a supply of more than one type of lubricant, it is a problem to handle them efficiently and in such a manner that they may be dispensed easily. An example of what can be done in such cases is well illustrated by the installation of a "junior" service station adjacent to a pressure maintenance plant.

Shown are the dispensing devices which not only make it easy to obtain the proper type of lubricant needed, but there are no drippings or accumulations of oil around this installation to make an unsightly appearance and increase the fire hazard. A large tank behind the units shown serves as a reserve tank for the lubricants which are unloaded from a tank truck on an adjacent road. The oils are pumped through buried lines into the proper storage tank.

The dispensing device in the center was fabricated in the welding shop and consists of a large lubricant reserve in the lower chamber, a standard rotary pump equipped with especially-fitted discharge piping to fill different sized cans, and a protective hood that is hinged to a backboard. To either side of this unit are orifice meter housings made of galvanized sheet metal. They were mounted in the usual manner, except somewhat lower to the ground. Instead of housing an orifice meter, these units provide shelter for dispensing oil cans and contain an outlet from the large tank located immediately behind them. The oil can is filled in either of these two cabinets where any overflow is collected in the bottom of the enclosure and may later be wiped up. The units handle different lubricants, such as upper lube and lower lube for the engines and compressors. The concrete walkway on which the units are placed makes a neat and easily cleaned installation.

HOW TO—Collect Rainwater to Cool Engine Radiators

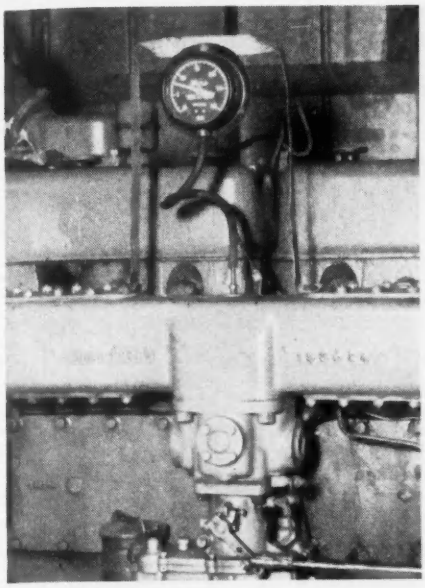
Wherever there is adequate rainfall to warrant a separate rainwater collection system for supplying cooling water, such systems are advantageous for several reasons. A supply of rainwater not only simplifies the water treating problem but eliminates the need for drilling water wells or installing a water system. It is certainly the answer to the pumper's job of keeping full the engine radiator of field pumping units in isolated areas.

This system is a modern adaptation of the ancient method of collecting rainwater flowing off the roofs of farm houses. This isolated field pumping unit, consisting of a gas engine and a reciprocating pump, is housed in a simple, sturdy protective building without sides. The sheet metal roof

has gutters that slope gently to the end of the building where there is a water reserve tank. The tank, of about ten barrels capacity, is supported on two vertical pipes set in the concrete base of the station. Two saddles are firmly welded to the tank to hold it in position. Rainwater is diverted into the tank through a galvanized tin gutter pipe.

The tank is elevated so that water gravitates into the radiator through a one-half-inch pipe. This pipe passes through one of the vertical supports, goes underground and comes back to the surface at the radiator of the pump engine. A small pipe discharges through a fillup valve into the radiator. By opening this valve, the pumper can fill the radiator quickly.

PRODUCTION HINTS



HOW TO—

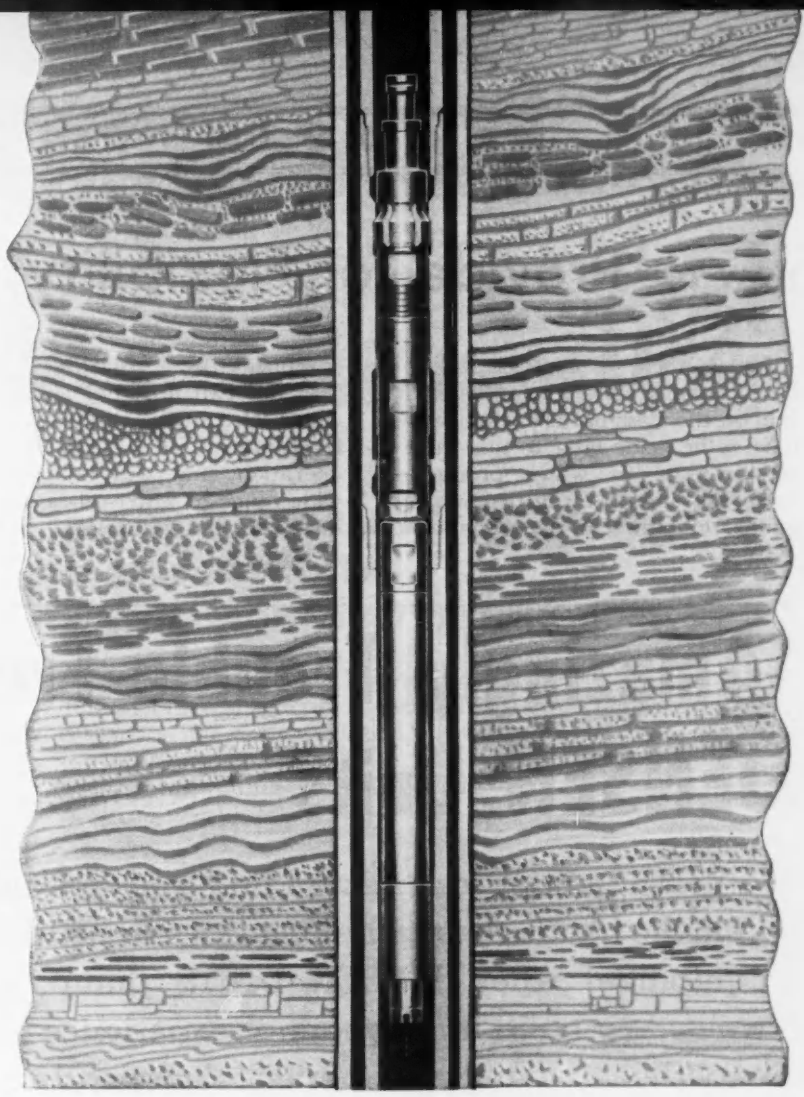
Place Vacuum Gauge On Intake Manifold

The efficiency of most types of internal combustion engines is indicated by the vacuum on the intake manifold, and particularly is this the case with gas-fueled engines that are converted from gasoline-gueled plants.

In the case illustrated, the sensitive vacuum gauge is placed on the engine so that it does not interfere with the maintenance of the engine. A short piece of strap steel, about one inch wide was bent to form the bracket on which the gauge is attached. Short tabs form the feet of the two supporting legs of the bracket. Half-inch holes drilled through the tabs permit them to be bolted to the inspection plates on either side of the carburetor attachment to the manifold. The horizontal segment is bent at right angles to the legs. A short bolt through a hole tapped in the middle of the cross member holds the gauge in place.

The manifold was tapped just above the point where gas was fed from the carburetor, so an accurate measurement could be made. A threaded plug was inserted and connected to a short section of rubber hose leading to the supported vacuum gauge.

The face of the gauge is large and its position on the engine makes it easy to read—in fact, the mechanic can hardly miss seeing the gauge when he enters the engine house. A constant check on the vacuum in the intake manifold insures good performance of the engine.



BOTTOM-HOLE HEATER

Otis Removable Bottom-Hole Regulators choke back well pressures at a point deep in the tubing string—where the sub-surface temperature is high. By moving the point of pressure reduction from the surface to the bottom of the hole, the tubing can be used as a sub-surface heating unit to reheat the gas after expansion—before it reaches the surface. Thus the costly installation and maintenance of heaters for surface connections can be dispensed with entirely. Too, Otis Regulators afford all the advantages of bottom-hole choking, automatically reduce the flowing pressure to safe, workable limits at the surface, and allow a controlled rate of production, regardless of the rate of withdrawal. For more than ten years, operators have also used Otis Bottom-Hole Regulators as a means of equalizing gas/oil ratios, to reduce water encroachment by maintaining a constant bottom-hole pressure, as a sub-surface separator to reduce emulsifying, to control high pressures during plugging and well killing operations, and in gas-lift wells. Contact your nearest Otis office for complete details on the many advantages of this versatile tool. There is no obligation, and afterwards you will be better informed on better production practices for your high-pressure wells.

PRESSURE CONTROL OTIS SERVICE – EQUIPMENT

OTIS PRESSURE CONTROL, Inc.

6612 Denton Drive • P. O. Box 7206 • TWX DL-220 • Dallas

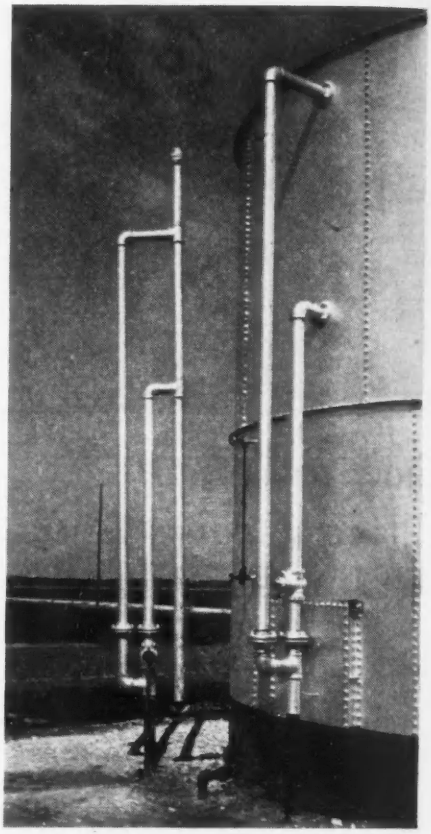
HOUSTON • CORPUS CHRISTI • LONGVIEW • VICTORIA
FALFURRIAS • ODESSA • NEW IBERIA • HOUMA
OKLAHOMA CITY • ELK CITY

Otis Removable Bottom-Hole Regulators

HOW TO—Provide for Flexibility of Gunbarrel Tank

Unless there is some flexibility in the original gunbarrel tank installation on the lease battery, changes will have to be made later to take care of the increase in water production.

In the original construction, the gunbarrel tank can be permanently equipped with a dual-water leg that provides two different levels for the water-oil contact. In most cases, two levels are sufficient for many years of operation, and will take care of a wide range in water-oil ratios. In this instance, the water leg is stationary in the conventional manner. The water outlet is attached to the lower section of the tank, with the riser extending slightly above the top of the tank, and remaining open to serve as a breather or pressure equalizer. The water tank take-off level was added by incorporating two two-inch tees in the vertical leg, and returning back to surface level with the discharge line.



Instead of one return line from the predetermined water-oil contact level, two return lins were installed. Both return lines join a common discharge line leading into the ground and to the salt water disposal system. A plug valve on the overflow line with the lowest elevation makes it possible to open or shut off the inner overflow leg.

If the lease is making a relatively large volume of oil, the valve can be opened, and the water-oil contact will be maintained at the lower overflow level. Should conditions change and increased volumes of water be produced, and it is desired to maintain a large volume of water in the tank, the valve may be closed.

Amazingly Trouble-Free JENSEN Units

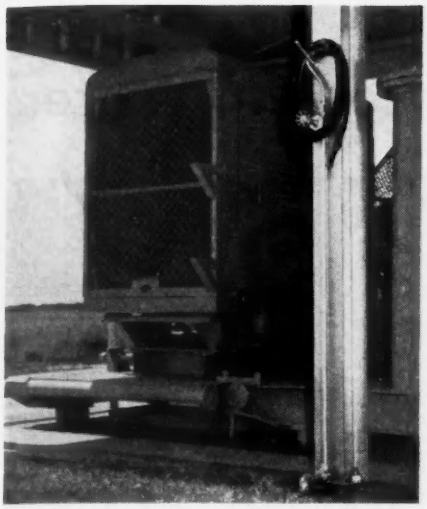
You lift oil for less money and you get away from the headaches common to less dependable equipment when JENSEN UNITS pump your wells. We build-in 30 years of experience—our experience and the experience of producers around the world.

Don't read this and turn the page. Call your nearest Jensen dealer NOW — or write us at Coffeyville for complete specifications on the trouble-free JENSEN UNIT to fit your well.

JENSEN

BROS. MFG. CO., INC., Coffeyville, Kansas

EXPORT OFFICE: 50 CHURCH ST., NEW YORK CITY



HOW TO—

Add Conveniences To Pump Station

Here are two ideas that have proved helpful in the maintenance and operation of a small field oil booster pump station. A reciprocating pump was driven by a gas-fueled engine. Keeping in mind neatness as well as utility, a water hose outlet was installed on one of the steel I-beam uprights supporting the metal building.

One-inch piping carries water up to the station, where a pair of ells bring the line inside the web of the beam, thereby protecting it and providing support. The control valve on this line is 4½ feet above ground level, and has a short section of rubber hose attached to it.

A low-pressure deflecting type valve at the end of the hose opens when the surrounding rubber body is bent slightly; the greater the deflection, the greater the flow of water. This short hose makes it easy to fill the engine radiator or clean up the area around the engine and pump. The two valves provide flexible control, with the deflection valve reducing the amount of wasted water.

Attached to the radiator of the engine are two angular steps that give the mechanic or pumper footing when inspecting the water level in the radiator or working over the engine. These steps are simply angle iron welded in the shape shown and then tack-welded to the heavy screen frame bolted to the front of the radiator.

These two small, but useful items, have helped keep this unit clean and have aided in its maintenance.

CRALL SPIRAL SCRAPERS

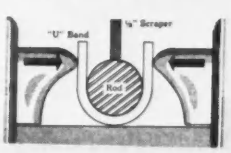
Pay for themselves!

- ELIMINATE PARAFFIN
- SAVE DOWN TIME
- SAVES WORK-OVER STRIPPING JOBS

CRALL Spiral Paraffin Scrapers pay for themselves. The original small cost is the ONLY cost. They're the one SURE way to eliminate paraffin in the tubing of pumping wells. They will not harm sucker rods or well tubing and will not slip on sucker rods.

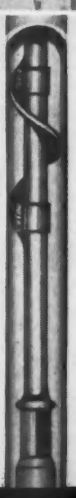
HERE'S HOW THEY WORK

1. Scrapers alternate — one right, one left — eliminating tendency of rod to unscrew.
2. Scrapers are attached to rods at our various fabricating plants, and stocked at supply stores.



Cross section showing "U" band being dieformed around rod to the scraper blades.

Cross section showing band held under pressure around rod while ends of bands are shrink-grip attached to scraper blades.



Order your CRALL Spiral Scrapered rods from your supply store or wire, write or phone . . .

PETROLEUM SPECIALTY CO.

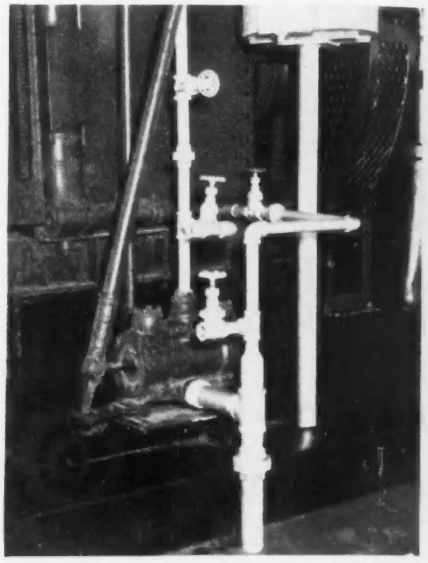
P. O. BOX 1640 PAMPA, TEXAS

Manufacturing, Fabricating Plants and Sales Offices

Pampa, Sundown and Odessa, Texas — Casper, Wyoming — Oklahoma City and Chickasha, Okla.

HOW TO—Handle Compressor Engine Cooling Water

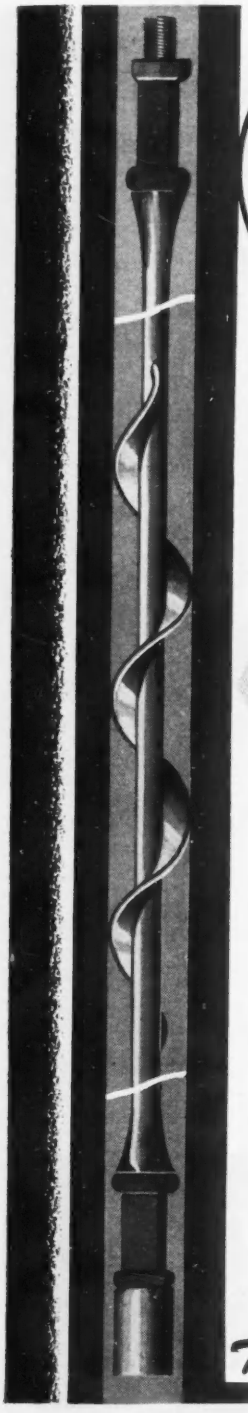
In many areas the chemical content of natural waters offers a problem when this water is used as a cooling medium. If considerable amounts of iron and other metals are in the water, it must be treated prior to use. For this reason, rain water, wherever it is convenient to collect, has been used in cooling applications not requiring large volumes of water. When collected from the roofs of buildings, the collection tanks are low, often on the ground. Unless this water reserve is connected into a pumping system for distribution, the operator must work out suitable means of handling the rain water.



While not a difficult one, this problem can be solved easily by using a small independently-controlled pump for circulation. In the case illustrated, a hand pump of the double-acting type is used. (This pump has been referred to in the field as a "handy billy" or as a "one-arm johnnie.")

The pump is mounted on an extension plate near the front of a skid-mounted engine which drives a large gas compressor used in a pressure maintenance project. A two-inch suction line passing below the building floor connects to the reserve tank outside the building. Through a reducing tee, the suction is tied into the hand pump suction. The one-inch discharge line extends upward and connects into the radiator fill line. Just above the pump on the discharge line is a tee from which a short nipple connects into a gate valve and an open pipe connection.

From the reducing nipple in the two-inch suction line, a one-inch line connects to the radiator drain line. Both radiator fill line and the connection to the drain are equipped with independent gate valves. Since the level of the water in the tank outside the building is at about the same level as that of the pump, the suction is always flooded, and the pump is easy to operate.



REMOVES PARAFFIN
•
NO WELDING NECESSARY
•
SAVE TIME • MONEY

INSTALLED AT WELL

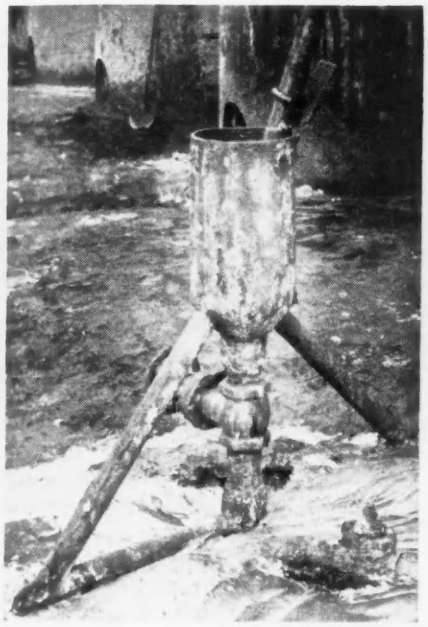
AT THE WELL SITE the scraper is applied by a crew member using any simple tool, such as screw driver or tire iron. And . . . after applying a few scrapers a crew member gets the hang of installation and really moves along so that he installs quickly and efficiently one scraper after another.

TRIPLE SPIRAL
PARAFFIN REMOVERS

* IS NOT WELDED in any way.
* CAN BE SALVAGED and used again on new rods.
* Eliminates cost of rod handling and transportation to factory or shop for installation.
* Spaced for any stroke length.
* Will not slip if rod is stressed—tested for 2350 lbs. grip.
* Now in use in EVERY AREA where paraffin is a problem.
* Sizes available for IMMEDIATE DELIVERY to fit 5/8" to 1" rods in 2" to 3" tubing.

Distributed by Sucker Rod Manufacturers
AVAILABLE THRU YOUR SUPPLY STORES
MANUFACTURED BY
The TRIPPLEHORN CO. P. O. BOX 6326 DALLAS, TEXAS

HOW TO—Check Salt Water Flow from Gunbarrel Tank



The pumper always needs to know how much water is being produced from a lease. In addition to using this information to determine the ratio of oil production to water, he needs it to handle the volume of water properly. Since the water production of some wells varies, particularly when they are shut in for several days during the month, it is essential that the pumper know what the production is so that he can adjust the water leg of his gunbarrel to suit the operating conditions.

A simple funnel device permits visual inspection of the water draining through the water leg of the gunbarrel tank. It consists of a modified funnel made of 13⅜-inch casing. The short nipple of casing, about 24 inches long, is orange-peeled down to a three-inch nipple which in turn is screwed into a gate valve.

Discharge from the device can be diverted two ways. Under normal conditions, the water flows into the evaporation pits. But if the ditches inside the firewall of the battery accumulate oil and form a fire hazard, this oil can be removed by flooding with water. In this case, the water from the gunbarrel is flowed into the ditches and the oil is carried off with the water.

The funnel is supported by two angle braces and a bottom cross member. An ell on the line buried about 18 inches below the ground level serves as added support. To keep the discharge line (shown at upper right) from the water leg of the gunbarrel tank in position in the funnel, a metal plate is welded to the upper edge of the large funnel, and a C-clamp placed around the two-inch discharge line.

announcing a new
Harbison-Fischer product—

HAYNES STELLITE
Super Alloy® Balls and Seats

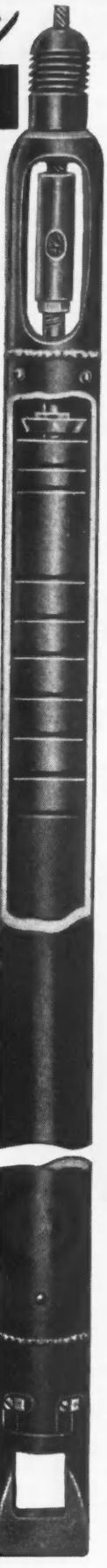
FOR HIGHLY CORROSIVE and ABRASIVE FLUIDS

Super Alloy Balls and Seats are currently available in the more frequently used sizes of rib and flat type seats, and in both regular and California styles. Other sizes are being added to the line as rapidly as possible to make a full complement of stocks for all A.P.I. *standard pumps.*

If you have pumping wells with extremely abrasive or highly corrosive fluids, we urge you to investigate these new Super Alloy Balls and Seats. They are unexcelled in wear resistance qualities and they are guaranteed to be corrosion-proof to any known petroleum gas and/or fluid. They have been developed scientifically — especially for service in tough wells, regardless of conditions. The alloy has a Rockwell C hardness of 64, a compression strength of 369,000 p.s.i., and an ultimate tensile strength of 77,000 p.s.i. The balls are finish-ground to within ±.001" and their sphericity is maintained within .0001" t.i.r. Each seat is individually ground and mated to the ball, and all seats are reversible for double life. Ask your local supply store about this new product . . . it will make more production possible . . . and more profitable production.

HARBISON-FISCHER MFG. CO. H·F FT. WORTH

Miller SAND PUMPS



In every major producing area where sand or sediment is a problem, you'll find Miller Sand Pumps and Bailers are standard . . . the leaders in clean-out equipment. For 26 years Miller has held this leadership, with continuous improvements and faithful service.

The Miller Sand Pump is made in regular and heavy duty types in sizes listed below. Lug type, chisel, sand and bailer bottoms are easily interchanged.

SAND PUMP and BAILER SIZES:

Outside Diameters

2½"
3"
3½"
4¼"
5"
5½"
7"

Lengths

20 feet
25 feet
30 feet

Special Sizes and Lengths Made to Order!

Write for new descriptive price list on Miller Sand Pumps and Bailers. See Composite Catalogue Page 3305 for details.

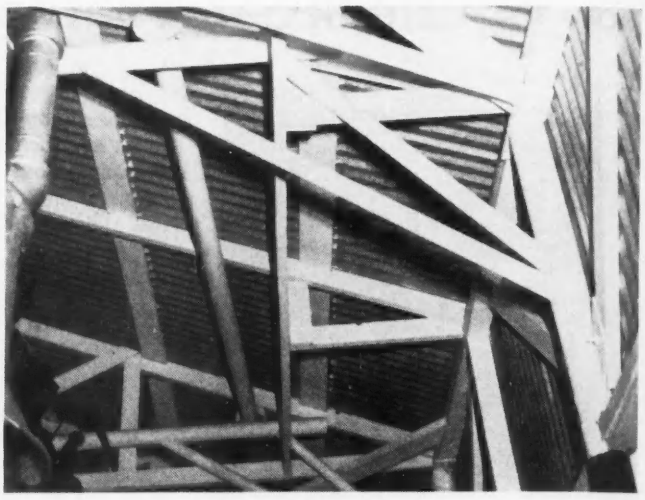
MILLER SAND PUMP CO.

1524 S. E. 29 St. . . . . Box 4516

OKLAHOMA CITY 9, OKLAHOMA

PRODUCTION HINTS

HOW TO—Add Crane to Framework

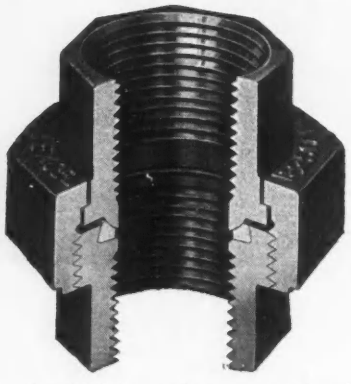


When extremely heavy equipment is permanently installed on relatively small pressure maintenance project located away from solid roads, it is essential that provisions be included in the original installation to handle future repair jobs. In most cases, the buildings housing these engine-compressor units are of wooden framework and corrugated sheet metal siding, and the job of lifting the heavy cylinder heads, pistons, etc., poses a problem. Construction of a complicated truss and traveling crane can be avoided by building an overhead hoisting device from pipe found around the average production camp.

This relatively simple overhead support is incorporated into the framework of a building which houses a compressor-engine unit. The main framework of the building is of timber, with the exception of two members that are parallel to engine-compressor lineup, but perpendicular to the roof joists.

Because the parallel four-inch pipe

Jefferson Malleable Unions



JEFFERSON'S *EXCEL* unions and union fittings available in brass-to-iron, and iron-to-iron seats. Certified Air Furnace iron used in the EXCEL line is A.S.T.M.-4733-Grade 35018 malleable, having a 53000 lb. Min. Ten.

EXCEL—
250 lb. S.W.P.—500 lb. C.W.P.

Certified Air Furnace iron produces a constant, uniform, finer grain structure union. This provides a much better iron with which to produce a positive dependable seating surface.

Unions manufactured from this malleable iron give 30% more strength; 50% more impact value; 75% more elongation. Sizes ¼" thru 3".

Obtainable through your jobber

Jefferson Union Company, Inc.

691 West 26th St.,
New York 1, New York

71 Gooding St., Lockport, New York

31 Fletcher Ave., Lexington 73, Mass.

members had to be elevated higher than the level of the 2 x 4-inch plates around the top edge of the walls, two angular braces had to be fabricated at each end of the four-inch supports. The braces were in turn welded to six-inch uprights which also support the roof.

One outstanding feature of this device is the rolling or traveling cross piece which supports the hoisting mechanism. This elongated spool is made of four-inch pipe that spans the parallel members. At each end is a flange of half-inch plate steel to prevent the spool from jumping or rolling off the horizontal supports.

In use, the spool is rolled over that part to be removed, and a hoist attached to it. After the work is completed, the hoist is removed and the spool rolled to one side of the building. In this fashion, any heavy part of the two units can be handled and repaired without the assistance of the usual heavy-duty overhead cranes.

HOW TO—

Facilitate Laying Down Sucker Rods

When a roustabout crew pulls a pumping well, one man is normally required to "tail-in" the rods in single joints to lay them down on a rack. If the breakout men are fast, the man tailing in the rods and stacking them is kept in a constant run. One fast-thinking crew member solved this problem and simplified his job by a simple means that eliminated a lot of walking.

A wooden trough about 40 feet long was made by nailing two two-by-fours together, forming a vee. This trough was set on wooden blocks to provide sufficient support for the device, which was elevated some 36 inches off ground near the wellhead, and sloped down to the level of the rack, which in this case was just two 12-foot joints of 12-by-12-inch timber.

The trough was parallel and to one side of the timber rack. It was thoroughly greased with cup grease so the rods would slide easily. When a section of rod was broken out, the tail-in man would place the pin end in the trough, and as the unit operator lowered the hook, the rod followed the trough to the end. After the elevators were released, the rod was handed to the tail-in man, who merely whipped it over the edge of the trough and onto the rack. While the crew was breaking out another joint, he was rolling the rod over the timber rack and placing it alongside the previously-pulled rod. In this manner, he had ample time to stack them in order.

When running the rods back in the hole, the process was reversed. The tail-in man would select a rod and place it on the top edge of the trough at the high end, and by giving it a little whip and guiding it with his left hand, the rod could be placed into the trough. It was latched in the elevators, and raised in the pulling unit for screwing onto the previous rod now in the well.

If you have a pumping well in a highly corrosive area, or if the fluid is extremely abrasive, and if you have had frequent, expensive workover jobs due to valve failures, ask your supply store for Haynes Stellite Super Alloy Balls and Seats. After you put them in your pump, you'll confirm these things to your own satisfaction — just as we did metallographically and chemically, and in our own pre-market well tests: A Rockwell C hardness of 64 . . . compressive strength of 369,000 p.s.i. . . . tensile strength, 77,000 p.s.i. . . . ball sphericity of .0001" t.i.r. . . . individually mated seats (reversible) . . . absolutely uneffected by corrosion or abrasion . . . and a guarantee backed by our more than 20 years in the ball and seat business. Specify Super Alloy and surprise yourself. You'll settle on Super Alloy for all your wells.

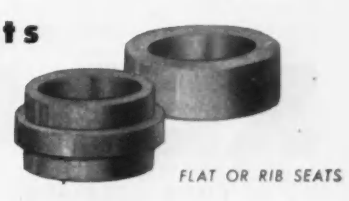
easy choice for hard pumping

HARBISON-FISCHER

HAYNES STELLITE

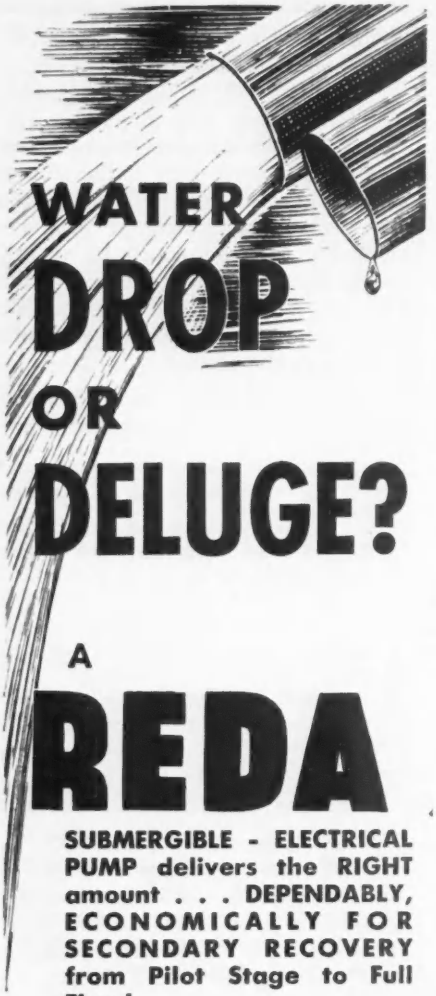
Super Alloy®

Balls and Seats



FLAT OR RIB SEATS

HARBISON-FISCHER MFG. CO. • FT. WORTH, TEXAS



WATER DROP OR DELUGE?

A REDA

SUBMERGIBLE - ELECTRICAL PUMP delivers the RIGHT amount . . . DEPENDABLY, ECONOMICALLY FOR SECONDARY RECOVERY from Pilot Stage to Full Flood . . .

ENGINEERING DESIGN

Reda Pumps produce the largest volumes obtainable from 5½", 7", 8⅝" casings, often reducing the required number of source wells. Corrosion resistance built into Reda Pumps materially prolongs time between pulling jobs, where corrosion is a factor.

ECONOMY

Reda Pumps reduce investment in number of supply wells required. Reda pumping equipment investment is less per barrel of daily capacity; pumping cost per barrel is lower.

FLEXIBILITY

To fit the changing needs for water volume as the flood progresses, Reda Pump can readily be altered or changed to larger or smaller sizes.

Reda Engineers have been closely associated with WATER FLOOD OPERATIONS for more than ten years and are fully qualified to assist operators in the selection of proper pumping equipment. A letter or phone call will bring prompt results.

REDA

PUMP COMPANY

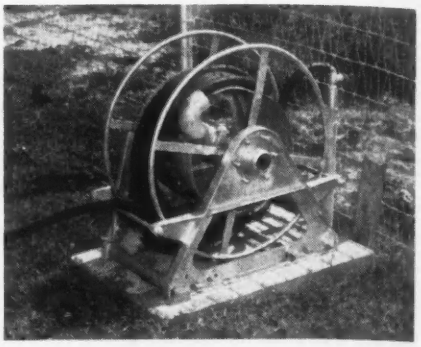
•

BARTLESVILLE, OKLAHOMA

PRODUCTION HINTS

HOW TO—

Store Water Hoses Around Field Camps



Illustrated is a hose and reel taken from a field servicing truck which was used during World War II to lubricate and service tanks and planes. These hoses carry compressed air, grease and lubricating oil. When one company purchased several such trucks for other jobs, these hoses and reels were excess and were immediately adapted to a completely strange service.

As an aid in watering the grounds around the production camp and compressor station these reels were mounted on small concrete foundations at strategic points in the area. With a 100-foot hose on each reel, a considerable area can be covered, and their use has greatly eased the job of the caretaker and yardman.

Each hose has a swivel connection that permits the reel to turn while water is flowing through it. Instead of putting hydrants in the middle of grass areas, the water connection can be made to one side where the reel is placed. A sheet metal housing protects these units from the weather.

A further advantage of the installation is that the hoses are instantly ready for use if needed for fire fighting.

The advent of war surplus material brought about many innovations in the oil field. Military trucks have been adapted for hundreds of field uses, and engines formerly used in tanks, boats and similar applications have been adapted for a variety of applications.

No. 2 of a Series

CASE HISTORIES of Houston Ready-Cut Installations

Shell Oil Company's TXL Gasoline Plant Camp Site at No Trees, Texas—A total of 23 units were completed at this camp by Houston Ready-Cut House Co. Materials were delivered, construction begun and finished, turnkey, exactly on schedule all under the careful supervision of our own crews. Homes are comfortable, attractive and well-constructed for years of use.

What are YOUR Needs?

IMMEDIATE DELIVERY anywhere in the world

★ 1 HOUSE OR 100

★ INDIVIDUAL UNITS, OFFICE BUILDINGS OR DORMITORIES

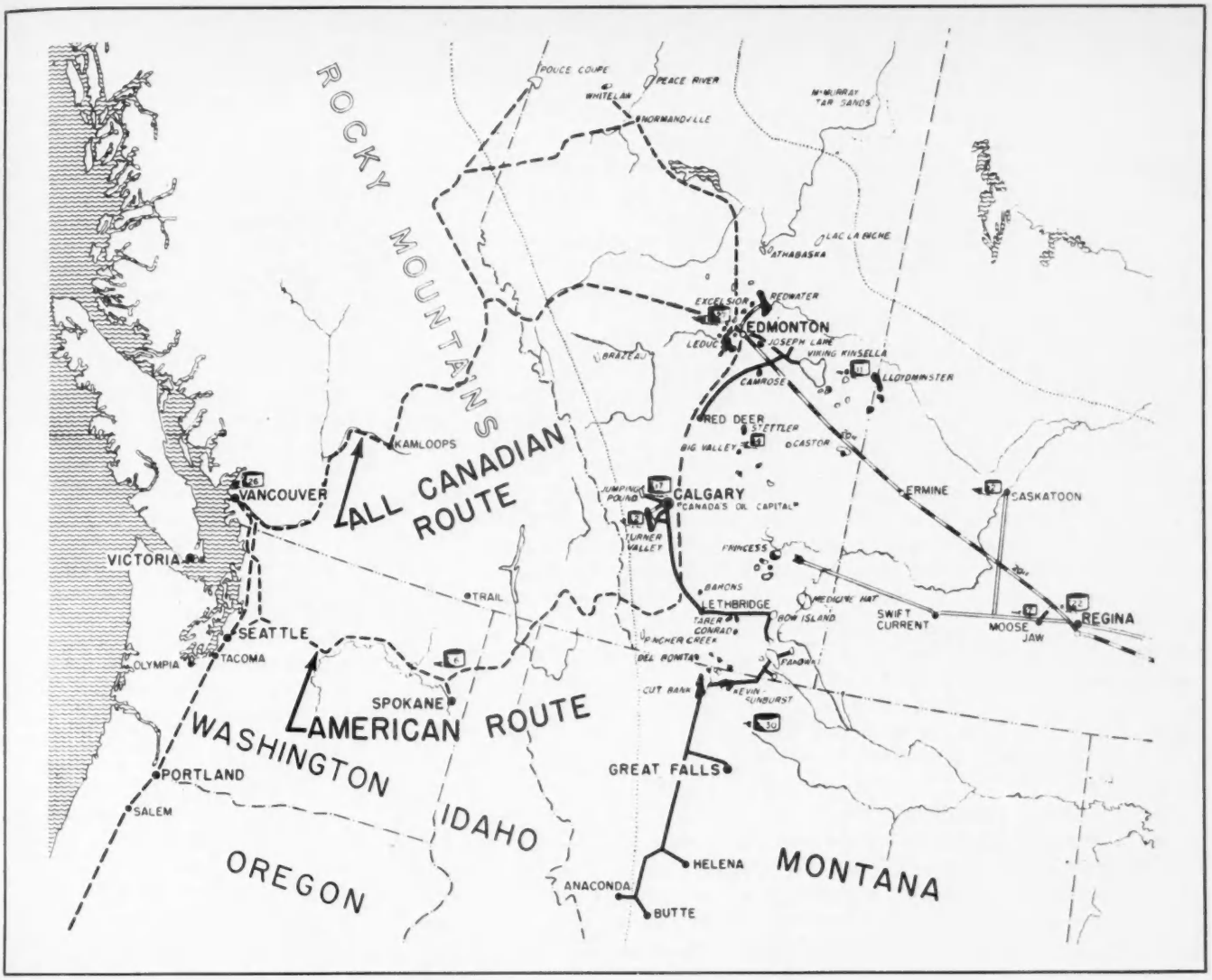
★ ERECTED COMPLETE OR FOR ERECTION BY YOUR CREWS

FREE SURVEY- phone or wire for a personal survey and estimate *without obligation.*

HOUSTON Ready-Cut HOUSE CO., Inc.

Prefabricated Housing for Industry Since 1917

P. O. BOX 124 HOUSTON 1, TEXAS



CANADIAN PIPE LINE EXPANSION

Assures Rapid Growth of Prairie Provinces' Oil Industry

By **BOB SHIELS**
Oil Editor, The Edmonton *Journal*

and

CECIL W. SMITH
WORLD OIL Staff

ALTHOUGH Canada's pipe line construction during the past year was not great in terms of total miles, it was most important and necessary to the increasing oil and gas development of Western Canada. Lack of transportation and markets for prairie oil production have been deterring factors to its development, and when Interprovincial Pipe Line Company's great carrier to the Great Lakes began operations late in 1950, it marked the beginning of new growth for the prairie provinces' oil industry.

Almost as soon as the line was completed it was inadequate; now Interprovincial is increasing its capacity by adding as many pumping stations as were built initially, and by looping about 100 miles of its central section. Included in the system's expansion program are plans for additional storage facilities at the Lake Superior terminal and the commissioning of additional tankers to carry the crude from that point to Sarnia.

Even after this line is expanded, Alberta will still be looking for markets for its oil. The result is that a

THE CANADIAN and U. S. west coast offers entirely new markets for Alberta crude and natural gas, and a dozen firms are clamoring for the right to build the giant pipe lines necessary to supply the area. The contestants and the projects they intend to construct if the Alberta government gives them the green light to export oil and gas are discussed in this article.

hot race for permits to export crude and natural gas from Alberta is being waged, with about a dozen applicants participating in the contest with proposals to build giant pipe lines, principally to the west coast. According to reports, the race is wide open, and before permits are granted there may be other proposals.

Product pipe lines, at present, are also getting their share of attention. A major line is being planned and another is already under construction for transporting the products of the expanding eastern Canadian refinery centers to eastern markets.

Several important new fields are now being connected with the Interprovincial system near Edmonton. One will connect Alberta's largest Viking sand oil field with the Great Lakes line, and the other will tie in a newly discovered Devonian pool.

Scheduled for immediate completion is the 20-mile six-inch line of Edmonton Pipe Line Company, Ltd., running from the Joseph Lake Viking field northwest to Edmonton, providing an outlet for 2900-barrel daily average production from the field's 65 producing wells.

The second new line nearing completion will pipe oil from Wizard Lake field, the year's outstanding discovery, located about five miles southwest from the southwest tip of Leduc production.

The Wizard Lake tie-in, an eight-inch line, will cover 42 miles, running to Nisku then to southeast Edmonton. Owners of the line are Texaco Exploration Company and McColl-Frontenac Oil Company, discovery team at Wizard Lake. Part of the production will go to McColl's newly-completed refinery in east Edmonton. The line will have an initial capacity of 12,000 barrels daily, but with additional pumping equipment could be capable of handling up to 30,000 barrels daily.

New Stations Planned

To carry more of Alberta's increasing production, Interprovincial is adding five pumping stations, planning a sixth, and preparing to loop about 100 miles of its line. Sites for the new stations will be Hardisty, Alberta; Loreburn and Glenavon, Sask.; Glenboro, Man.; and Viking, Minn. The proposed sixth station will be built at Deer River, Minn., at a later date.

The addition of the new stations and loops is designed to raise capacity of the line from 95,000 barrels daily to 135,000 barrels per day. It was reported that actual crude movement topped 100,000 barrels per day during the third quarter of this year.

The 16-inch section of Interprovincial's line from Regina, Sask., to the international border at Gretna, Man., will have about 100 miles of loops added. The exact locations will not be determined until land rights are secured, but they will likely be installed in the vicinity of Glenaven, Cromer and Glenboro.

Prospects for continued expansion of pipe line facilities are excellent. During the past year, Alberta's oil development was marked by the number of discoveries made, particularly in the central sector of the province.

New pipe line outlets will be needed as some of those discoveries develop into large producers. In addition, many of Alberta's smaller fields are enjoying speedy expansion, indicating that present truck and tank car transportation soon is likely to be replaced by pipe line connections.

Pipe line prospects for the Dominion as a whole depend upon the outcome of applications by a dozen companies for export of oil and natural gas from Alberta. Applications for permits to export gas were being heard by the Alberta Petroleum and Natural Gas Conservation Board during November.

Proposed are lines leading east to Montreal and west to British Columbia and the Pacific Northwest. If the conservation board gives the green light to any of those projects, new gathering and feeder systems will become an immediate requirement within the provinces' boundaries.

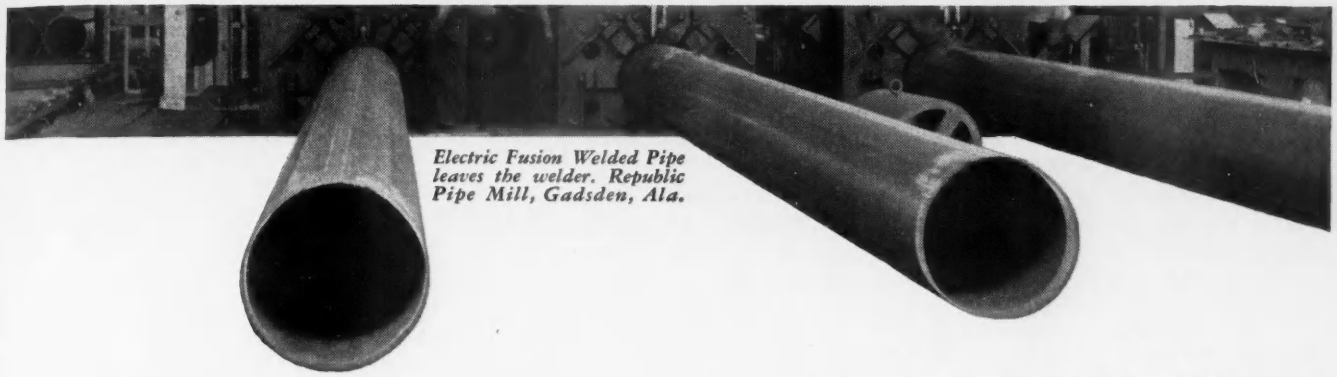
Six companies either have been incorporated or have filed notices of application to the Canadian government for incorporation under the Dominion Pipeline Act with proposals to build crude lines from Alberta. Five of the six proposals are for taking crude to the Pacific Northwest (Oregon, Washington, and British Columbia) and the other offer is for transportation of crude to the prairie provinces and Winnipeg markets.

The following are applicants and their proposed crude lines:

1. Westcoast Transmission Company, Ltd., proposes to build a crude line over an all-Canadian route with one segment originating at Dawson Creek area of Alberta and one segment starting in the Edmonton area, and both joining at Kamloops, B. C. The line would run to Vancouver, with an extension south to Seattle, and would parallel the company's proposed natural gas line. The oil carrier would be 16-inch in diameter with capacity of 75,000 barrels per day, which could be increased by additional pumping equipment. Total mileage from either Edmonton or Dawson Creek to Vancouver is 780 miles and estimated cost of the line is $50 million. This project is being designed and engineered by Ford, Bacon & Davis.

2. Alberta Natural Gas Company and Northwest Natural Gas Company

A six-inch crude oil line connects the Joseph Lake field with Imperial refinery at Edmonton.



Electric Fusion Welded Pipe leaves the welder. Republic Pipe Mill, Gadsden, Ala.

BIG PIPE *doing a big job...*

It's Republic Expanded Electric Fusion Welded Pipe, now being produced in BIG sizes—24 through 30-inch OD. And, it's doing a big job in helping natural gas move to new nation-wide markets.

This large diameter high pressure line pipe is electric fusion welded inside and out. It is hydraulically expanded to uniform size, straightness and circumference. This hydraulic expansion also increases its yield strength for even safer handling of high pressures.

In every size, this big pipe helps hold field welding costs down. Because its circumference always is constant, field joints line up accurately and quickly. The entire circumference can be welded at top speed . . . lowest cost. Line construction moves fast!

What's more, its uniform wall thickness provides an even distribution of metal which further speeds field welding of circumferential joints.

All the facilities of Republic's completely integrated pipe mill at Gadsden, Alabama, are 100% devoted to production of Expanded Electric Fusion Welded Pipe. Republic is doing everything possible to see that the big pipe is ready for its big jobs.

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, New York

Another new natural gas line goes in. Crew is applying field coating and wrapping to Republic Expanded Electric Fusion Welded Pipe in Texas.

Republic
REPUBLIC STEEL
ELECTRIC FUSION WELDED LINE PIPE

hope to construct a 16-inch crude line to parallel their proposed natural gas line. The route is described as the "American" route and runs due south from Edmonton through Crows Nest Pass of southeastern British Columbia, thence through the northern tip of Idaho to Spokane, and due west across Washington to Seattle. An extension would run north to Vancouver. No data is available on cost, but when announced the line was supposed to have a capacity of between 60,000 and 80,000 barrels per day. The total distance from Edmonton to Seattle to Vancouver is 980 miles.

3. Trans Mountain Oil Pipe Line Company, sponsored by Bechtel Corporation, Socony Vacuum Oil Company, Imperial Oil Ltd., and Gulf Oil Corporation, expected to have its formal application with the Board of Transport Commissioners considered late in November, for the construction of a 24-inch $90 million crude line from the Edmonton area over an all-Canadian route to Vancouver, approximately 751 miles long. Late in October the company was reported to have completed financial arrangements for the project. It would have initial capacity of 75,000 barrels daily and a maximum capacity of 200,000 barrels a day. This applicant does not propose a lateral line to the U. S., but would transport crude to Washington and Oregon by tanker from Vancouver.

4. Border Pipeline Corporation has applied for incorporation and made application to build an "American" route crude line from Edmonton to Spokane and Seattle and a branch running to Vancouver. That course would roughly follow the route proposed by Alberta Natural and Northwest Natural for their crude and gas lines. Border's proposal would be a 16-inch line with maximum capacity of 150,000 barrels daily.

5. Independent Pipeline Corporation, sponsored by Federated Petroleums, Ltd., Calgary producing company, proposes to build a crude line over an all-Canadian route from Edmonton to Vancouver, with a branch to northwestern U. S. Total length would approximate 720 miles, and cost has been estimated at $60 million.

6. Boundary Pipe Line Corporation has applied for incorporation and stated intention to build a crude line from Calgary eastward to Winnipeg.

Proposals that Alberta natural gas be exported to the Pacific Northwest and to Eastern Canada have been presented before the Alberta Petroleum and Natural Gas Conservation Board in gas export hearings at Calgary, and the board's decision is not expected for several months. The proposed gas lines are:

Proposed Gas Lines

1. Prairie Pipe Lines and Pacific Northwest Pipeline Corporation have suggested that Alberta natural gas be piped to the Pacific Northwest area in exchange for an equal amount of gas from Texas to be delivered near Windsor for distribution to Ontario and Quebec consumers.

The proposal was made by Robert G. Herring, of Pacific Northwest Pipeline, who said if Prairie Pipe Lines is given an export permit, the company will deliver Alberta gas to its parent firm, Pacific Northwest, at the British Columbia-Washington border, at a point east of Vancouver.

Rather than take Texas gas to the Pacific Northwest, the parent company would contract with a Texas producer for gas to be carried to Ontario, according to Herring's proposal. He pointed out that gas from Texas could be shipped over a shorter route than from Alberta to Eastern Canada. Prairie Pipe Lines would take its gas supply from five southern Alberta fields—Cessford, Countess-Brooks, Medicine Hat, Princess-Patricia and Pincher Creek.

2. Northwest Transmission Company, if given a gas export permit will be prepared to start construction on a gas pipe line next spring. It proposes to build a line from northwest Alberta through interior British Columbia to Canadian and American west coast cities.

3. Westcoast Transmission Company, Ltd., proposes a natural gas line from Dawson Creek area of Alberta, through interior British Columbia, to Vancouver, Seattle, and Portland. The line would parallel the same company's proposed crude line. A second line proposed by Westcoast would run from the Pincher Creek gas field in southern Alberta to Spokane. Westcoast, sponsored by Pacific Petroleum, Ltd. and associated companies, was the first entry in the gas pipe line race that started more than two years ago.

4. Trans-Canada Pipelines, Ltd., a subsidiary of Delhi Oil Corporation of Texas, proposes to export gas from Alberta through a 2240-mile pipe line to Montreal by an all-Canadian route. Cost of the project was estimated at $253 million.

That line would be built from Princess, in southern Alberta, parallel to the Canadian Pacific Railway main line to Winnipeg, over an all-Canadian route through Ontario to Sudbury, south to Toronto and along the northern shore of Lake Ontario and the St. Lawrence River to Montreal, a distance of about 2100 miles. The capacity of the line would be 365 million cubic feet of gas daily.

5. Alberta Natural Gas Company, Ltd., and Northwest Natural Gas Company propose to export 80 billion cubic feet of gas annually to serve southern British Columbia and the Pacific Northwest. Originally, it was planned to build an integrated gas gathering system within Alberta, but the companies were prevented from doing so by lack of steel. Now they propose to take gas initially from the most accessible fields, and to expand the grid system when warranted and when restrictions are lifted on use of steel.

The line would be built from Edmonton, running due south and then west to Crows Nest Pass, B. C., thence across northern Idaho to Spokane. From that point the line would run due west to near Seattle with lateral lines south to Portland and north to Vancouver.

6. Canadian Montana Gas Company has just completed a 16-inch pipe line from the Pakowki Lake area gas fields to the Alberta-Montana border to supply gas to its U. S. parent company, Montana Power Company. This is the first exportation of Alberta gas permitted and it is limited to 50 billion cubic feet spread over a five-year period. Montana Power will transmit the gas to the defense plant of Anaconda Copper Mining Company in that state. Alberta consented to this movement of gas outside its borders after requests were made by both the Canadian and American governments.

Already under construction is Imperial Oil's Sarnia to Toronto refined products pipe line. This system will have a daily capacity of 39,000 barrels of gasoline, kerosine, and heating oils when completed. The Sarnia to London leg is the section now being built. The London to Toronto section and a spur to Hamilton will be laid in the spring.

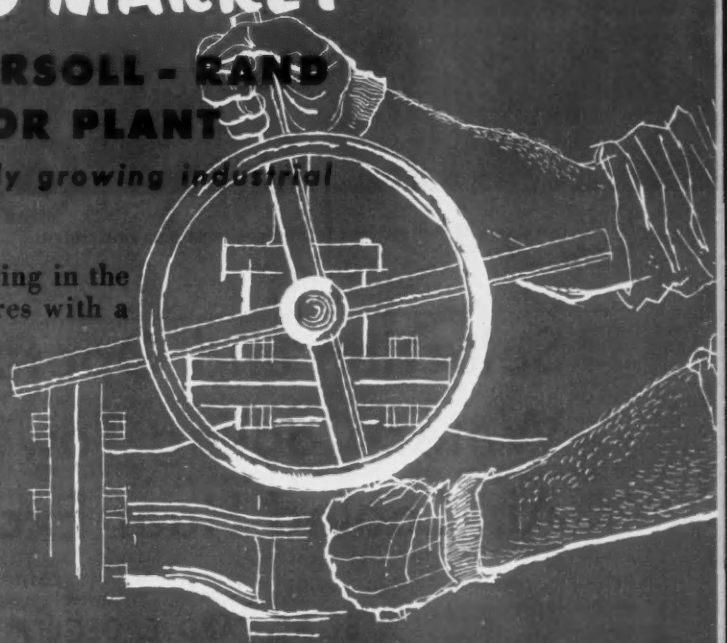
In the planning stage is a line that will also supply the Toronto and Hamilton area with refined products from the Montreal East refineries of British-American, Shell, and McColl-Frontenac. This line is to be built by Trans-Northern Pipe Line Company, Ltd., and will be about 400 miles long.

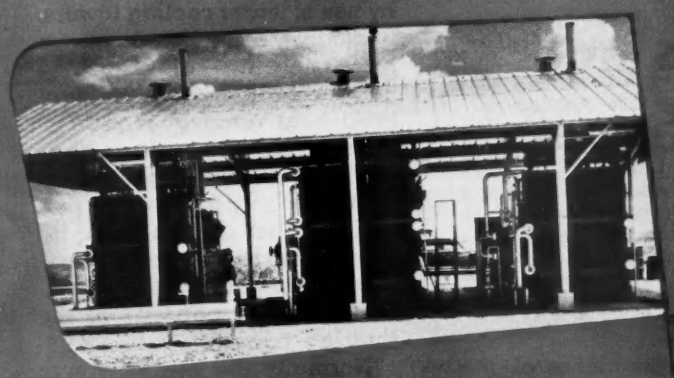
Send YOUR GAS TO MARKET

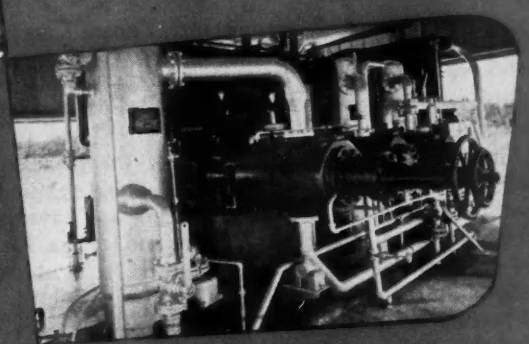
. . . WITH A BEAIRD - INGERSOLL - RAND PACKAGED COMPRESSOR PLANT

Put your idle gas to work in the rapidly growing industrial and residential markets.

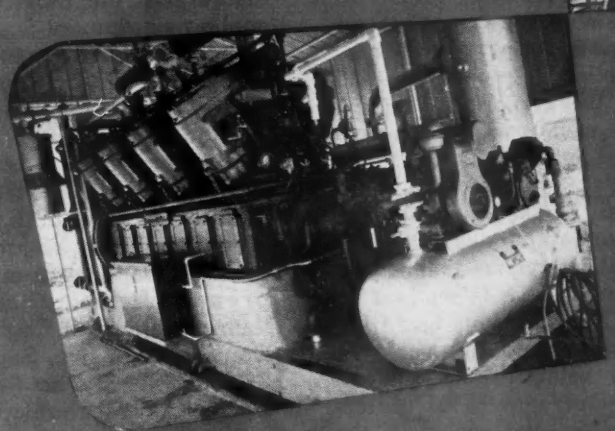
The low pressure gas you are now flaring or leaving in the ground can be compressed to marketable pressures with a Beaird-Ingersoll-Rand packaged compressor plant.







BEAIRD-INGERSOLL-RAND PACKAGED COMPRESSOR PLANTS are manufactured in 5 sizes from 110 h.p. to 440 h.p.



EASY TO OPERATE

You don't need a highly trained compressor operator for a Beaird packaged unit. Little more than routine daily servicing is required.

WORKS DAY AND NIGHT

Automatic safety controls guard the operation of a Beaird compressor, and keep it working for you 24 hours a day without an attendant.

ADAPTABLE

If a packaged plant is no longer required after a period of service, it may easily be adapted to other operating conditions or to other services.

A GOOD INVESTMENT

Men who use them say that Beaird packaged units have paid for themselves in as short a time as one year.

NOTE: *Scrubbers, piping, gas cooling and supplementary equipment are designed to meet your particular requirements.*

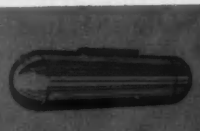
THE J. B. BEAIRD COMPANY, INC. SHREVEPORT, LOUISIANA

SINCE 1918 BEAIRD SHREVEPORT

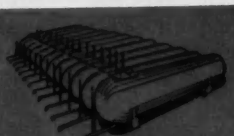
PACKAGED COMPRESSOR PLANTS

L.P.G. SYSTEMS

CAST STEEL FITTINGS

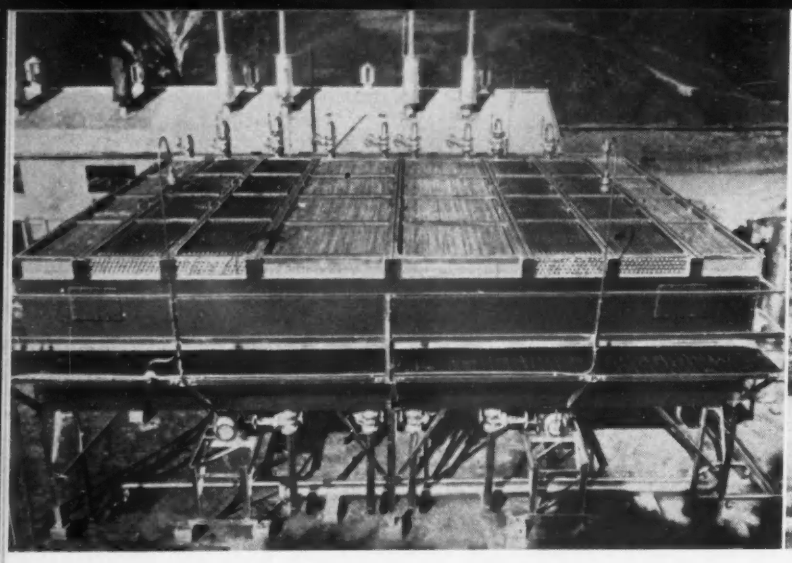


ANHYDROUS AMMONIA EQUIPMENT

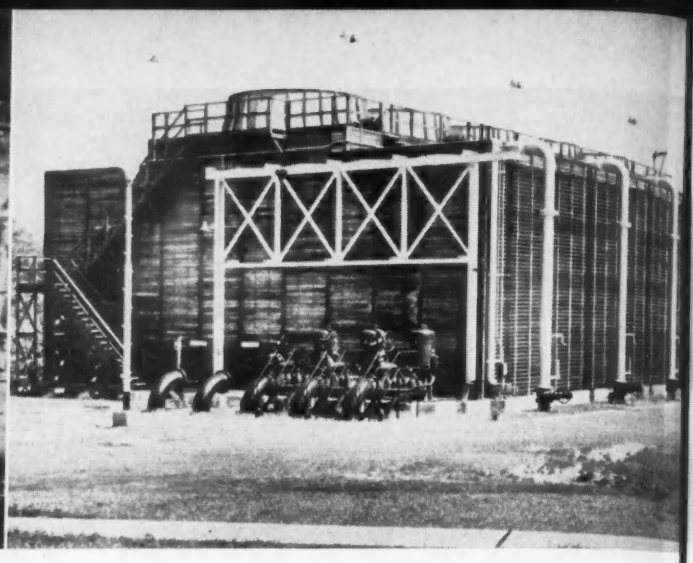


PRESSURE BULK STORAGE

MACHINING
FABRICATING
STEEL WAREHOUSE



Three sets of coil sections for dry-cooler at pipe line station.



Large capacity five-cell double-flow induced draft cooling tower serving condensing equipment.

Selection and Operation of Water-Cooling Towers and Air-Cooled Heat Exchangers

By HOWARD E. DEGLER

The Marley Company, Inc., Kansas City

THE MOST common method of cooling in pipe line stations is by use of water cooling towers. Recently there has been an increasing use of air-cooled heat exchangers. Where high-level heat removal is permissible, these dry-surface coolers have advantages where water is expensive or polluted. Other advantages include small space requirements, simplicity in starting, and ease of control of the freezing hazard.

Normally the cooling tower is more economical, but the cost of the dry-cooler decreases relative to that of the tower as the temperature of the fluid to be cooled rises. A careful evaluation of both methods should be made to insure that the most suitable cooling equipment is selected in each case. An example is given of a cost comparison of these two competitive cooling methods.

Also included is a discussion of the operation and maintenance of both cooling towers and dry-surface coolers. This paper was originally presented before the Petroleum Mechanical Engineering Conference, Tulsa, September 24-26, 1951, of The American Society of Mechanical Engineers.

RECENT water crises in the Southwest, California, New York, and elsewhere in the U. S. have brought to public attention basic shortages of underground and surface water that engineers have been predicting for decades. The conservation and re-use of cooling water has become a necessity in the above and other widely scattered areas, each of which has its individual problem of water supply and usage.

Large water users include power plants, refrigeration, and the manufacturers of petroleum products, chemicals, rubber, paper, textiles, rayon, linen, lactose, sugar, foods, liquors, explosives, hydrogen, steel, and many others. Water usage has doubled in the past decade and today's requirements of many process industries are frequently in excess of 300 pounds of water per pound of finished product. Therefore the selection of the most practicable cooling method for re-use of water or its elimination as a coolant becomes more important as new processes are perfected, industries expanded, and power demands increased.

Mechanical-draft cooling towers can cool water by evaporation to a temperature approaching the wet-bulb temperature of the ambient air. This water-cooling method requires less than one percent evaporation of the water circulated to economically dispose of the process heat load.

Air-cooled (finned-tube) heat exchangers are having increased acceptance and usage for "high-level heat removal" (e.g. above 130° F. referred to 100° F. dry-bulb air), where water is scarce, expensive, and/or badly polluted; low maintenance cost of control are other features.

A water-cooling tower is an enclosed structure for the evaporative cooling of water by contact with moving air (Figures 1 and 2). Water, when cooled by the evaporative effect, transfers to the air about 1000 Btu per pound of water evaporated. The heat contained in the water vapor thus produced is known as the latent heat of vaporization. Air, absorbing heat from water in this manner, is capable of cooling water below the atmospheric (dry-bulb) temperature. This distinctive fact permits water cooled by the evaporative method to serve applications having a great variety of heat-removal requirements, and it also enables a small volume of water to dispose of a much greater heat load than would otherwise be possible.

In a water-cooling tower, as the water falls from level to level, over the wood filling (Figure 2), it splashes into fine droplets and spreads out over the wood slats in thin films, thus providing additional water surface to the upward-moving air. The rate of heat transfer, hence the water-cooling effect, will be accelerated by: increased air velocity, added water surface, higher hot-water temperature, and lower humidity (wet-bulb) of the air for a given size tower.

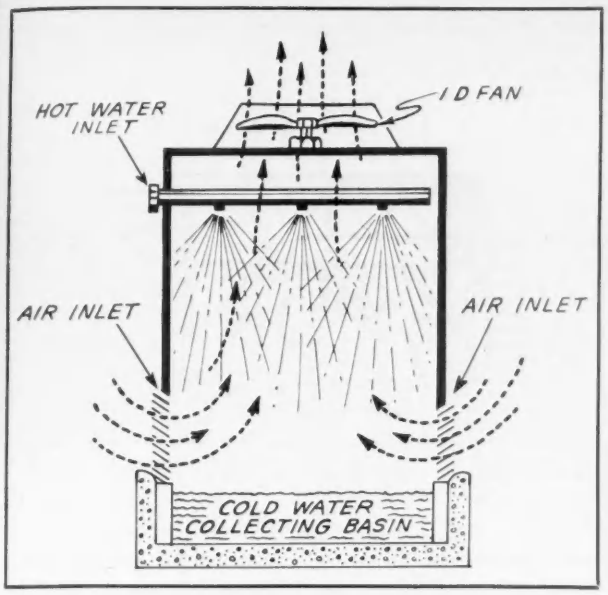


FIGURE 1. Basic elements of a spray-filled counterflow water-cooling tower.

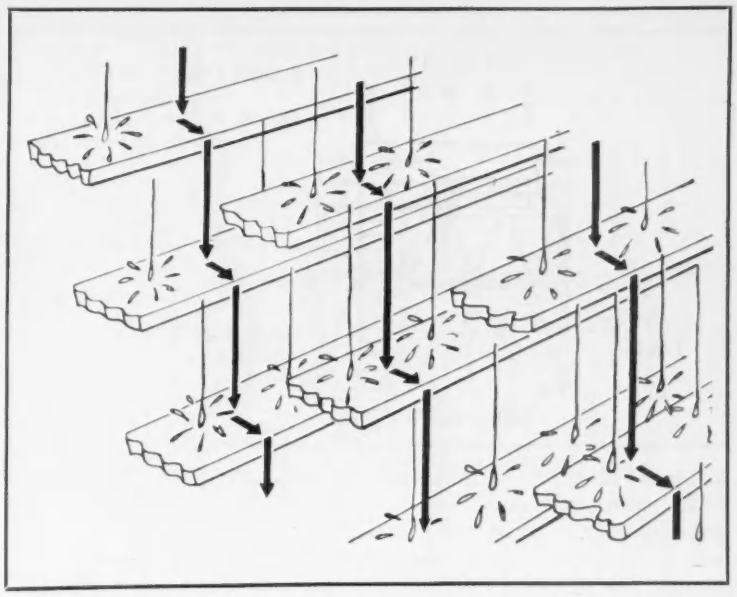


FIGURE 2. Wood fill in towers provides more cooling surface and water break-up.

Cooling Tower Definitions

A WATER-COOLING TOWER is an enclosed device for evaporatively cooling water by contact with air. In atmospheric water-cooling equipment the heat transfer is accomplished partially by a transfer of sensible heat (about 25 per cent) which raises the wet-bulb temperature of the air; but most of the cooling is due to an exchange of latent heat (about 75 per cent) resulting from the evaporation of a small part of the circulating water.

A NATURAL-DRAFT TOWER is one in which the air movement through the tower is dependent only upon atmospheric conditions.

A SPRAY-FILLED TOWER (natural draft or mechanical) is one which is dependent solely on spray nozzles for water break-up.

A DECK-FILLED TOWER is one which contains baffling to increase the water break-up of the distributing system and to provide additional wetted surface.

A MECHANICAL-DRAFT TOWER is one utilizing one or more fans to move air through the tower, the fans being an integral part of the tower.

A FORCED-DRAFT TOWER is a mechanical-draft tower having one or more fans located in the air intake to the tower.

AN INDUCED-DRAFT TOWER is a mechanical draft tower having one or more fans located in the air outlet from the tower.

Operating Terms

Those who operate or manufacture distinctive major mechanical equipment or apparatus gradually develop a somewhat specialized "glossary" of words and phrases that describe particular related functions, parts, or characteristics of such equipment. The most common of such terms as applied to atmospheric water-cooling equipment are the following:

COOLING RANGE is the number of degrees F that the water is cooled with the water-cooling equipment. It is the difference in temperature between the hot water coming to the cooling tower and the temperature of the cold water leaving the tower.

APPROACH is the difference in degrees F between the temperature of the cold water leaving the cooling tower and the wet-bulb temperature of the surrounding air.

HEAT LOAD is the amount of heat dissipated by the water-cooling tower in Btu per hour (or per minute). It is equal to the pounds of water circulated times the cooling range.

PUMPING HEAD is the pressure required to lift the water from the top of the water in the basin to the top of the tower and force it through the water distribution system. It is equal to the static head plus the velocity head and friction loss in the water system.

DRIFT is the small amount of water that escapes from atmospheric water-cooling equipment in the form of fine droplets and is that water which is entrained by the circulating air. Drift is a water loss independent from that water lost by evaporation; it can be reduced by good design.

BLOW-DOWN (bleeder by-pass or waste) is the continuous or intermittent wasting of a small part of the circulating water in order to minimize harmful concentrations of chemicals in the water. In most localities the water used in a cooling tower contains dissolved solids. The water that is evaporated in the tower does not carry away its solids and as a result the solids concentration is built up unless some of the concentrated water is drained off and replaced with make-up water. These solids decrease the evaporative properties of the circulating water, and they may cause sludge dposits in the system or corrosion of metals.

MAKE-UP water is that required to replace the water lost by evaporation and drift and blow-down.

The type of water-cooling equipment used affects to a considerable extent the operating temperatures of the fluid to be cooled. Spray ponds and natural-draft towers depend upon prevailing winds for cooling the water, hence these units must be designed, built, and selected for low wind velocity conditions. Such equipment cannot continuously maintain the desired cold-water temperature (or a close approach to the wet-bulb air temperature), hence mechanical-draft equipment must be employed to produce the required air movement and obtain low cold-water operating temperatures.

Progress of the cooling tower industry is apparent when it is realized that for a definite need, a modern water-cooling unit requires only one square foot of ground area as compared to 50 square feet for the spray pond and about 1000 square feet for a natural cooling lake or pond. The continuous demand for a more compact design, better construction, lower cost, larger capacity, greater flexibility of operation, independence of atmospheric uncertainties, and improved all-around performance has resulted in the modern induced-draft water-cooling tower.

A dry-surface cooling unit is a device for cooling or condensing fluids by circulating them through finned tubes and forcing or inducing atmospheric air across the coil sections. The dry-surface cooler is basically a non-contact convection-type heat exchanger. One arrangement for a dry-cooler is the induced draft unit (Figure 3) with the fan mounted on top discharging the air upward and inducing air across a horizontal bank of finned tubes mounted below the fan. Another arrangement is the forced-draft unit (Figure 4) with the fan discharging

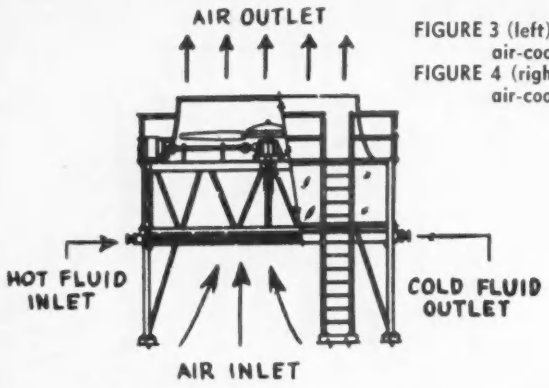
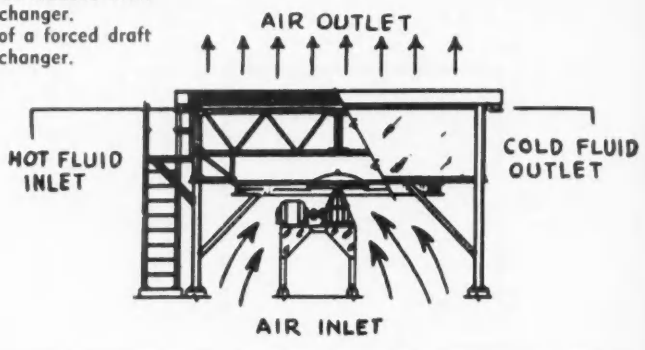


FIGURE 3 (left). Section of an induced-draft air-cooled heat exchanger.
FIGURE 4 (right). Section of a forced draft air-cooled heat exchanger.



air upward across a horizontal bank of finned tubes mounted above the fan. Small portable units are conventionally arranged with a vertical coil-bank mounted to receive a horizontal stream of air across the finned surfaces.

Selection of type of dry-surface cooler may be based upon the design considerations and operating characteristics shown in Table A.

The dry-cooled heat exchanger may be used for applications of "high-level heat removal" where temperatures of the fluids to be cooled are above 130° F., referred to a 100° F. dry-bulb ambient air temperature, and where water is scarce, expensive and/or badly polluted, or where the "portable" features of a dry-cooling unit would be desirable. Other advantages include small space requirements, simplicity in starting, and ease of control of the freezing hazard.

The water-cooling tower would generally be used in preference to the dry-cooling unit when cold-water temperatures are less than 130° F. and which could approach (within a few degrees) the wet-bulb temperature of the air, e.g., 85° F. cold-water to an 80° F. wet-bulb. Other tower advantages are the wide range of cooling applications especially adaptable to low temperature cooling as required for steam power, refrigeration, foods, etc., and especially applicable for economically cooling very small (5 gpm) or very large (over 30,000 gpm) capacities.

Normally the cooling tower is more economical, but the cost of the dry-cooler decreases relative to that of the tower as the temperature of the fluid to be cooled rises. Both units have their own applications but in some instances either type may be used. A careful evaluation (see page 149) of both methods should be made to insure that the most suitable cooling equipment is selected in each case.

When selecting the design air temperature for dry-surface coolers, it is generally acceptable to choose a dry-bulb temperature[1] which will not be exceeded more than 5 percent of the hours between noon and midnight during the months of June to September, inclusive. The temperatures that occur in excess of this design value will be of such short duration as not to have an appreciable effect on efficiency or performance. Generally used dry-bulb design temperatures are 95° to 110° F.

Cooling Range, see Figure 5a, is the number of degrees that the fluid is cooled in an air-cooled heat exchanger. Approach is the difference between the temperature of the cold fluid leaving the dry-cooler and the dry-bulb temperature of the ambient air.

Theoretically, water may be cooled by the evaporative method (as in a cooling tower) until its temperature is lowered to the air's wet-bulb temperature. In practice, however, water is cooled to a temperature approaching the wet-bulb; the closer this "approach" the larger the size of the cooling equipment required for a given duty. Generally used wet-bulb design temperatures[1] are 70° to 80° F., depending upon the service and geographical location of the unit.

Cooling range, see Figure 5b, is the number of degrees that the water is cooled with water-cooling equipment. It is the difference between the temperatures of the hot water coming to the equipment and temperature of the cold water leaving. Approach is the difference between the temperature of the cold water leaving the cooling equipment and the wet-bulb temperature of the ambient air.

Water Cooling Towers

Types. The mechanical-draft tower consists of an upright shell constructed of wood, metal, transite, or masonry, in which water is distributed near the top uniformly over the area, this water drops through upward moving air circulated by fans and falls into the cold-water collecting basin.

Performance of mechanical-draft towers is practically independent of wind velocity hence it is possible to design them for more exacting performance. They require less space and less piping than natural-draft towers, and the pumping head varies from 12 to 50 feet, depending upon the design. Higher plant economy due to the colder water temperature obtained generally more than offsets the additional operating expense and initial cost as compared with natural-draft towers.

A forced-draft tower is a mechani-

TABLE A

Induced Draft	vs.	Forced Draft
1. Less recirculation of outlet air.		1. Mechanical equipment is simpler and more accessible.
2. Better air distribution over coils.		2. Simpler structure (isolated drive).
3. Coil sections close to ground, easier to clean.		3. Unitized or other than electric-motor drive.
4. Maximum protection from weather.		4. Less power (± 5 percent).
5. Walkway unnecessary.		5. Increased freezing hazard.

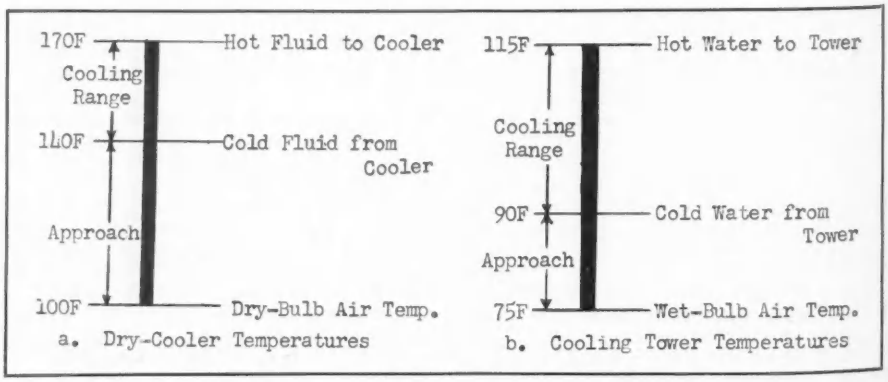


FIGURE 5. Definition of "cooling range" and "approach" for air-cooled heat exchangers and water-cooling towers. (Temperatures in above diagrams are illustrative only, subject to wide variation.)

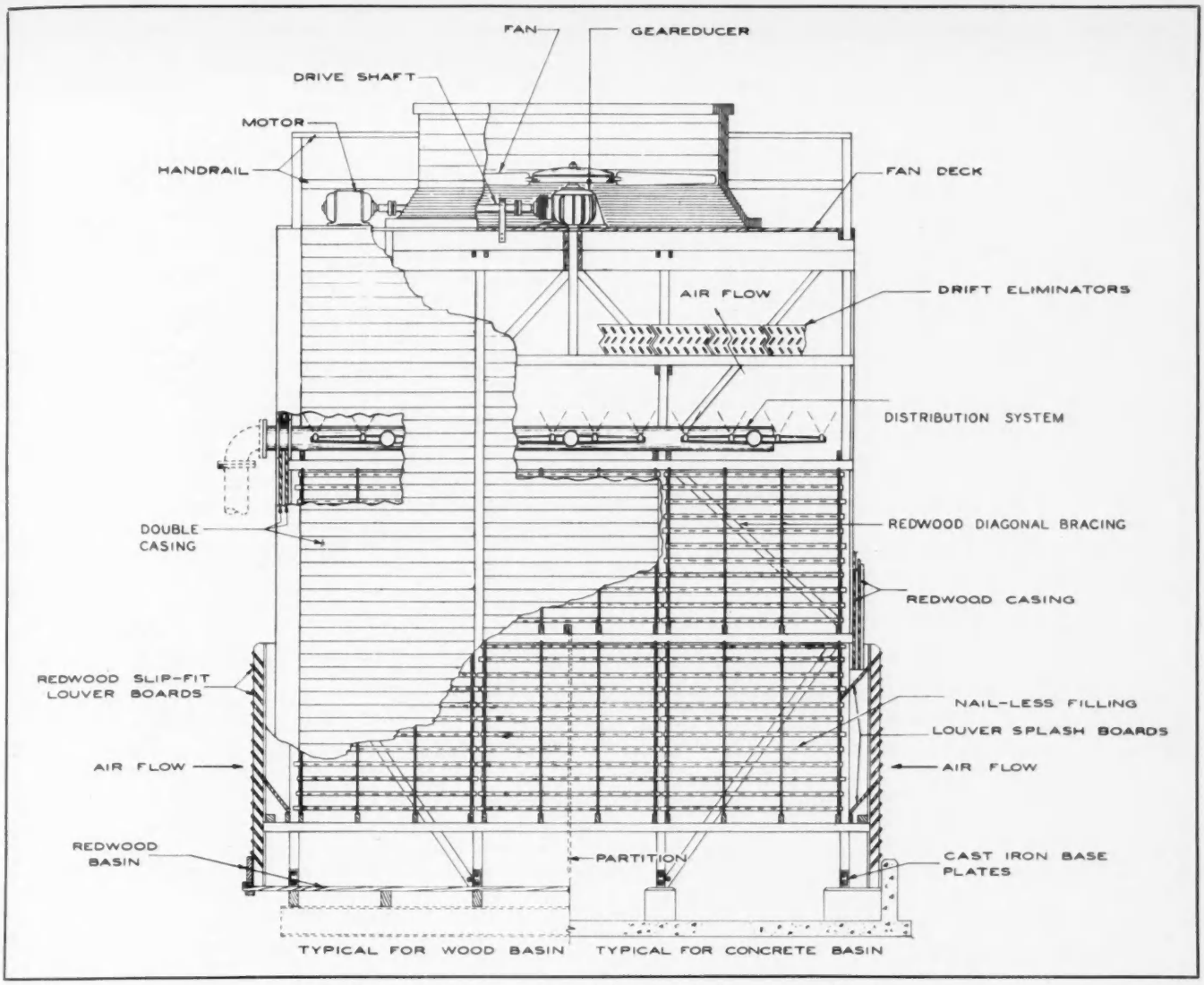


FIGURE 6. Section through an induced-draft counterflow water-cooling tower.

cal draft-tower having one or more fans located in the air intake to the tower. Greatest objection to the forced-draft tower design is that the heated air leaves the top of the tower at a low velocity and is subject to "recirculation" to the fan inlet; this action may reduce performance as much as 20 percent. Operating costs are high because of high fan power requirements, and maintenance and depreciation both are high by modern standards.

A "conventional" induced-draft cooling tower consists of one or more individual adjacent cells, each having its own induced air-circulation fan (in outgoing air stream), with gear and motor drive mounted on top of the tower structure. Generally wood filling is used to provide wetted cooling surface and water break-up. In many cases, a combination of the wood-filled and spray-filled design is used, see Figure 6.

Another type of induced-draft tower is the crossflow design (also called "double-flow"), Figure 7, which provides compactness, open accessible hot-water distribution system, low pumping head, low draft loss because of large air-inlet and drift-eliminator area and air flow being parallel to flat side of fill surface height approximates tower height, and increased flexibility for varying performance requirements, with heavy water loadings being possible.

This distinctive tower, Figure 7, employs multiple fans (adjustable pitch blades) centered along the top, each fan drawing air through two cells paired to the plenum chambers which is partitioned beneath each fan and fitted with drift eliminators that also turn the air upward toward the fan outlet. Air movement is horizontal with water falling in a cascade of small drops through the air stream and across the wood-fill surfaces. Air travel is longer than with the conventional counterflow design as shown by Figures 1 and 6.

Selection. Because of the many variables in water-cooling tower calculations and performance, it is difficult to provide simple handbook equations and tables whereby an engineer can readily select the type and size of unit for a definite water-cooling requirement. Each manufacturer has a semi-confidential method of sizing a tower, based largely upon research and actual performance tests. Selection of cooling equipment for any specified service must ultimately depend upon overall considerations established from reliable design and performance data.

The performance of a cooling tower is improved by increasing the amount of filling, height, area, and/or air quantity. Increasing the tower height increases the length of time the air is in contact with the water, without seriously affecting the fan power required, but increases the pumping power. Increasing the tower area while maintaining constant fan power increases the air quantity somewhat and increases the time that this air is in contact with the water because of lower velocity. The surface area of water in contact with the air is increased in both cases.

Increasing the air velocity through the tower decreases the time the air is in contact with the water, but since a greater quantity is passing through, the average differential between the

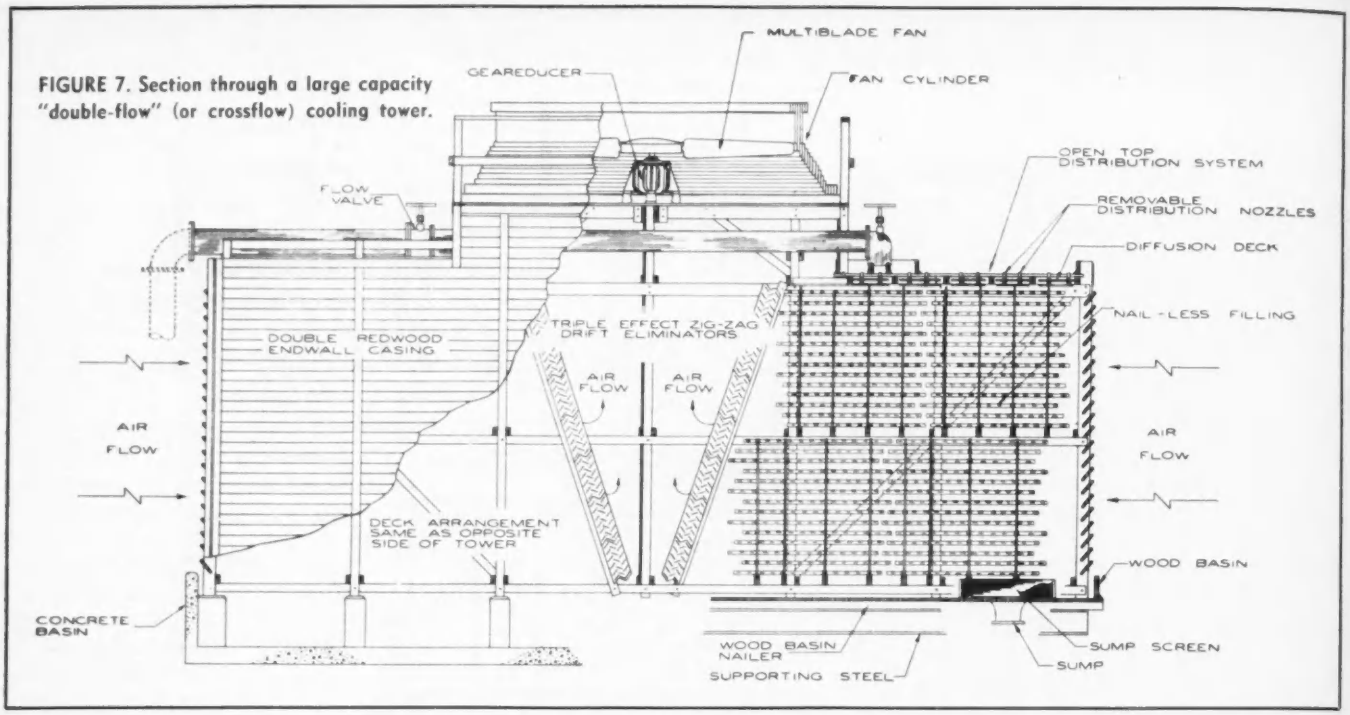


FIGURE 7. Section through a large capacity "double-flow" (or crossflow) cooling tower.

water temperature and wet-bulb temperature of the air is increased, and this increases the rate of heat transfer. Increased air quantities are obtained only at the expense of increased fan power (horsepower increases approximately as the cube of the air quantity). Air velocities through induced-draft towers vary from 300 to 450 fpm over the fill area (plan) of the structure.

Evaluation of Costs

A comparison of costs for various types of cooling equipment for a given application requires detailed study. To obtain an estimate, a complete analysis must be made; first cost, power costs, water costs, maintenance, etc., can be evaluated over the life expectancy of the equipment. The calculation may be made as follows:

Annual operating costs = Maintenance + Depreciation + Power Costs.

$$A = M + \frac{C}{t} + P$$

where A = Annual operating costs
M = Maintenance, insurance, taxes, etc., figure furnished by purchaser.
C = Cost of equipment, would include any or all of: 1) Cost of unit erected; by manufacturer. 2) Pumps, piping, etc.; by purchaser. 3) Electrical work; by purchasers.
t = Time in years, estimated life of equipment.
P = Power costs per year for fan/s and pump/s.

Example. A 900 bhp, 300 rpm, two-cycle, solid injection, pump scavenged, diesel engine in Oklahoma is to be cooled with recirculated water. Make necessary estimates and select cooling equipment required. Prepare an evaluation showing cooling tower and air-cooled exchanger costs upon a basis of operation at full fan speed for 24 hr/day, 8 mo/yr for 15 yr, power at $0.015 per kwh.

Calculation. The cooling system for this type diesel engine absorbs about 2500 Btu per bhp-hr. Assume a shell-and-tube exchanger (with cooling tower) designed to cool jack water from 170° to 158° F., and that the raw water temperatures are to be 115° and 95° F. to a 73° F. design wet-bulb air temperature.

Heat to water = 900 bhp × 2500 Btu = 2,250,000 Btu per hour.

$$\text{gpm} = \frac{2{,}250{,}000}{60 \times 8.33 \times 20^\circ} = 225 \text{ gpm raw water circulated through tower}$$

$$\text{gpm} = 225 \times \frac{115^\circ - 95^\circ}{170^\circ - 158^\circ} = 385 \text{ gpm soft water through engine jacket}$$

Power Cost = $0.015 × 24 × 30 × 8 = $86.40 per Kw per year

(See Table B.)

Operation and Maintenance

Pages of recommendations could be written on the starting-up, operating, maintaining and shutting down of cooling equipment in order to obtain optimum results under varying load requirements and changing weather conditions. The life of any piece of cooling equipment is directly dependent upon its built-in features, type of service, severity of operation, general care and maintenance, and climatic environment.

The continued utility of all cooling equipment depends primarily upon the maintenance of the mechanical equipment; next in importance is cleanliness of the unit; water treatment (with necessary blow-down) is a must for most systems using cooling towers.

Well maintained units would probably give good performance for years whereas a neglected unit might decrease its cooling efficiency as much as ½ percent per month for some years. It should be emphasized that there are many cooling tower installations which are 15 to 20 years old, and still giving practically as good service as the day they went into operation.

Unless a good maintenance schedule is followed, decrease of cooling per-

TABLE B

Evaluation Costs of Cooling Tower and Air-Cooled Exchanger for Same Cooling Requirements

900-HP. Diesel Engine—5760 Hours per Year (8 Months)
385 gpm Soft Water, 170° to 158° F.
225 gpm Raw Water, 115° to 95° F.

Equipment, Maintenance and Power Costs	Cooling Tower	Air-Cooled Exchanger
Cooling Tower and Basin	$1800	.....
Shell-and-Tube Heat Exchanger	950	.....
Pump (raw water) with Motor	250	.....
Air-cooled Exchanger with Foundation	.....	$2900
Piping and Soft Water Pump	400	400
Electrical Work	350	300
Cost of Equipment "C"	$3750	$3600
Maintenance (5% and 3%)	$ 190	$ 110
Water and Treatment Cost	350	30
Insurance at 2%	75	72
Taxes at 1M	38	36
Contingencies at 2%	75	72
Maintenance, "M"	$ 728	$ 320
Fan horsepower	5 hp.	10 hp.
Pump horsepower	3	2
Kilowatts = Hp x 0.746 / 0.88 motor eff.	6.8 Kw	10.2 Kw
Power Costs at $86.40/Kw/Yr., "P"	$ 587	$ 880
Annual Operating Costs, $A = M + \frac{C}{15} + P$	$1565	$1440

In this case it's refining, but whether the job be refining, pumping or transmission, you'll find Electric Power on the job — rendering safe, dependable, economical service. The top photo shows the new "cat" tower of a major oil company at Drumright, Okla. The bottom photo is a view of the refinery's storage facilities as seen from atop the tower. Here, as in countless other locales, Electric Power is doing the job Let *PEP go to work for you. Consult the Power Engineer of your nearest Electric Power Company for details on how you, too, can enjoy the many advantages of Electric Power.

*PEP — Purchased Electric Power

Petroleum Electric Power Association

ORGANIZED IN THE INTEREST OF GREATER SERVICE TO THE PETROLEUM INDUSTRY

CALL YOUR NEAREST ELECTRIC SERVICE COMPANY FOR MORE FACTS
OR ADDRESS YOUR REQUEST TO P. O. BOX 2771, DALLAS, TEXAS

formance would result. Economizing on cost of labor for maintenance would also result in increased expense for replacement parts and periodic repair costs. There may be a few installations where this approach might be applicable with soft water, and where there is no dust or sand in the air with no algae growth. However, any equipment which has motors, fans, gears, pumps, etc., is of necessity susceptible to failure unless regularly inspected, lubricated, and maintained.

Water Treatment. Treatment of cooling water includes: prevention of corrosion and scale formation on heat-exchanger equipment; prevention and control of algae; and control of deterioration of cooling tower lumber.

The amount of make-up water required depends upon evaporation loss, drift loss, and blow-down. Evaporation losses average 0.75 percent of the water circulated for each 10° F. range. Drift loss is the water carried away by the air current in the form of droplets or mist. This loss approximates one-tenth of one percent of the water circulated.

The amount of blow-down required depends upon the hardness of the circulating water, the type of water softener or inhibitor used, and the amount of drift loss. Blow-down is normally controlled to maintain the concentration of dissolved and scale-forming solids below the point where the formation of scale would occur or would be caused by corrosion. The total amount of solids introduced by the make-up water equals the total removed by the blow-down, hence the ratio of make-up to blow-down indicates the number of concentrations in the system.

Mechanical Maintenance. A regular daily inspection schedule is recommended to determine whether the cooling equipment is operating properly. The cooling unit in operation becomes but part of a system made up of several other auxiliaries. Therefore, it may be blamed for unsatisfactory performance which is only a symptom of failure in another part of the system.

Reduced cooling range indicates a light heat load or excess water quantity. Increased cooling range indicates heavy load or insufficient water quantity. When a condenser or heat exchanger becomes badly scaled, water quantity circulated is frequently retarded and pumping head increased. Higher cooling water temperatures usually indicate this condition. Thus, if water quantity is incorrect: 1) check pump for speed, pressure, and freedom from air; 2) check condenser for scale, air, or restrictions; and 3) check pipe lines for air, partially closed valves, dirt, or restrictions.

Cold Weather. Extremely cold weather normally does not increase performance to any great extent, but operating hazards are increased considerably; the cold water temperature is seldom less than 60° F. Cooling towers operated in freezing weather are subject to ice formation at the air inlets; ice may form on the inlet louvers and nearby wood-filling as these surfaces become lightly wetted by fine drops of water which splash toward the entering air stream. Ice starts to form on the lower section of louvers and progresses upwards; this accumulation of ice will restrict the inlet area and reduce the air flow, thus increasing the temperature of the water being circulated through the tower.

To prevent icing during cold weather operation, one or more of the following procedures are recommended for induced-draft towers: a) shut-down or reduce speed of fans, but do not shut off water; b) cover upper portion of louvered area with canvas, etc., and/or c) shut off some of the cells.

If ice should form on the louvers and filling, one of the following methods of removal could be used: a) reversing (for a limited time) the rotation of the motor driving the fan and thus blowing the warm air backwards and out through the louvers; b) shut down some fans temporarily but do not shut off water; and/or c) cover upper portion of louvered area with canvas, etc.

Operation and maintenance of the mechanical equipment *for air-cooled heat exchangers* is similar to that discussed on the previous page for cooling towers. Instructions issued by manufacturers should be followed for proper lubrication and care of the equipment. Clean and paint all corrodible metals as required.

Certain fouling factors are used when estimating the size and performance of a finned-tube cooling unit: an increase of operating temperatures and greater pressure drop through a heat exchanger frequently indicates excessive fouling and the need for cleaning of the tubes, internally and/or externally.

Unusually high dry-bulb temperatures of air may prevent an air-cooled heat exchanger from performing according to the design conditions, but most operating problems will arise in cold weather. In cold weather care must be taken that the temperatures of the circulating fluids do not become too low. In some gas-cooling coils hydrates are formed on the walls of the tubes if the gas is cooled excessively and if there is any moisture in the gas.

When cooling liquids or gases containing water, the water might freeze causing considerable damage to the tubes, headers, or piping. In cooling lube oil or other viscous fluids, the viscosity would increase with decreased temperatures tending to increase operating pressures in the system. Close check on the temperatures of the fluids can be obtained if thermometer wells are installed in the lines from the unit and the operating personnel required to take periodic readings of these temperatures. In some cases a warning light or bell actuated by a device in the return coil header is warranted.

Intermittent winter operation of fin-tube sections where the fluid might freeze requires draining of these sections and exposed piping during inoperative periods as a safeguard against freezing. If sections are drained during cold weather they should be blown out with compressed air or flushed out with anti-freeze solution; fin-tube sections are made and installed so that sections will drain, but scale and sludge in tubes may hold enough liquid to freeze and split the tubes. Drain and vent should be left open and a blank flange inserted at inlet flange connection of each drained section. In this way there would be no danger of freezing in the drained section even though the shut-off valve might develop a leak.

Dampers are sometimes provided on dry-cooling units; these should be set so as to vary the air flow across each coil section to provide the desired cooling effect. Cold weather operation requires almost complete closing (setting depends upon air temperature) of the dampers in order to minimize freezing difficulties.

Conclusion

It is impossible to formulate any set of recommendations that would definitely establish the selection of a given cooling method as being the most suitable for any particular application. The anticipated performance, operating features, and ease of maintenance of a proposed installation must be completely analyzed, and the final selection frequently becomes a matter of engineering compromise and personal preference. It is significant that, as the need for water conservation increases, the manufacturers of cooling equipment have been accumulating a great reservoir of experience by continuously making more economical units and more highly specialized applications.

REFERENCE

[1] Consult local U. S. Weather Bureau Statistics or "Summer Weather Data" by J. C. Albright, published by the Marley Company, Inc., Kansas City.

greater ruggedness...

Midget Angle

New with the HMA of today

- Exceptional capacity for temporary overloads
- Lowered fuel consumption
- Full precision bearings
- Extra heavy, forged steel crankshaft
- Parco-Lubrized power cylinders and pistons
- Special, heavy duty radiator
- Simplified maintenance

You
REALLY LIVE
at an
Affiliated
National Hotel

AFFILIATED NATIONAL HOTELS

ALABAMA
HOTEL ADMIRAL SEMMES ..... Mobile
HOTEL THOMAS JEFFERSON ..... Birmingham

DISTRICT OF COLUMBIA
HOTEL WASHINGTON ..... Washington

INDIANA
HOTEL CLAYPOOL ..... Indianapolis

LOUISIANA
JUNG HOTEL ..... New Orleans
HOTEL DESOTO ..... New Orleans

NEBRASKA
HOTEL PAXTON ..... Omaha

NEW MEXICO
HOTEL CLOVIS ..... Clovis

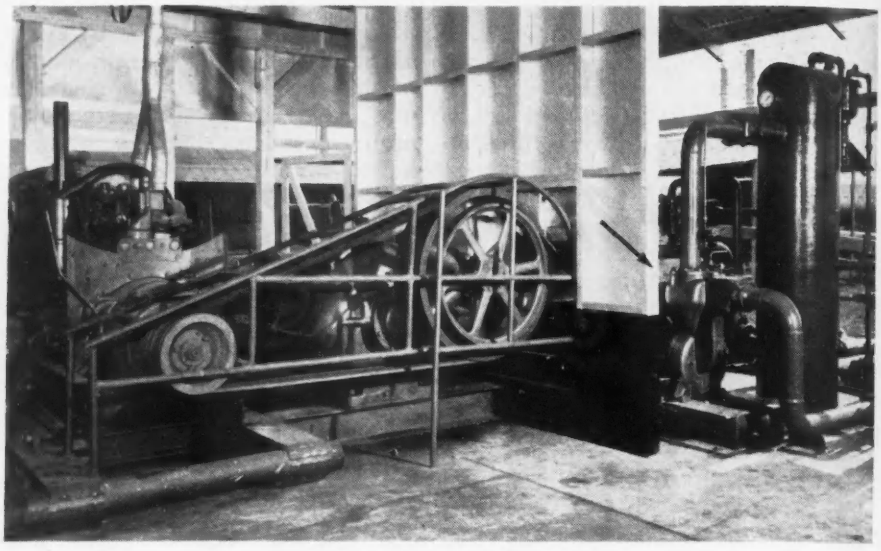
SOUTH CAROLINA
HOTEL WADE HAMPTON ..... Columbia

TEXAS
HOTEL STEPHEN F. AUSTIN ..... Austin
HOTEL EDSON ..... Beaumont
HOTEL BROWNWOOD ..... Brownwood
HOTEL TRAVIS ..... Dallas
HOTEL BAKER ..... Dallas
HOTEL CORTEZ ..... El Paso
HOTEL BUCCANEER ..... Galveston
HOTEL GALVEZ ..... Galveston
HOTEL JEAN LAFITTE ..... Galveston
CORONADO COURTS ..... Galveston
MIRAMAR COURT ..... Galveston
HOTEL CAVALIER ..... Galveston
HOTEL PLAZA ..... Laredo
HOTEL LUBBOCK ..... Lubbock
HOTEL FALLS ..... Marlin
HOTEL CACTUS ..... San Angelo
HOTEL MENGER ..... San Antonio
ANGELES COURTS ..... San Antonio

VIRGINIA
HOTEL MOUNTAIN LAKE ..... Mountain Lake
HOTEL MONTICELLO ..... Norfolk

Conveniently Located in 21 Prominent Cities

HOST TO THE NATION



Centrifugal Pump Increases Crude Throughput

By TOM L. TURNER
The Gorman-Rupp Company, Oilfield Division

BY DRIVING a small centrifugal pump off the same engine which powered a reciprocating pump, crude oil output from a small pipe line station was increased from 170 to 270 barrels per hour and four hours' pumping time was saved each day. The only expense was a small self-priming centrifugal pump. No additional horsepower was required to effect the high increase in capacity.

This station operated a 5½-inch x 10-inch duplex double acting power pump, V-belt driven by a gas engine. Prior to revamping, the pump averaged only 170 barrels per hour of 60 SSU 43 degree API crude oil during a 16-hour pumping period. As head was lowered in the tanks, pump efficiency dropped off and a much lower figure in barrels per hour resulted.

The company installed a self-priming centrifugal pump near the suction of the reciprocating pump, as shown in the accompanying illustration, and powered it with a 30-inch sheave mounted on the existing driven sheave on the pump.

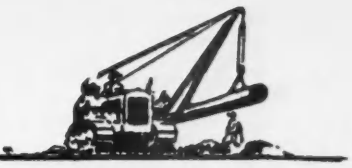
The centrifugal pump was piped to take suction from field lines to the tank farm and to discharge into a volume chamber fabricated from a length of 24-inch pipe. This chamber serves as trap for slugs of air which are sometimes fed into the system when field tanks are emptied. An air trap atop the volume chamber discharges oil to suction of the pump and allows air to blow into a nearby pit.

A four-inch suction line leads from the volume chamber to the reciprocating pump. A manifold permits direct suction from storage tanks.

Selection of a self-priming centrifugal pump to be unitized with a reciprocating pump overcame the problem which arose when slugs of air were fed into the reciprocating pump and at the same time, took advantage of the higher efficiency of the centrifugal pump. Since the centrifugal pump is both valveless and jetless and has only one moving part—the impeller—it does not emulsify or foam the oil.

Pulling a vacuum of 17 inches, the centrifugal pump increased the average number of barrels of oil handled by the reciprocating pump from 170 to 270 barrels per hour. The increase, effected without adding additional operating personnel or engine horsepower, enabled the company to cut station operating time four hours each day.

PIPE LINE *Construction*



Projects Announced and Contracts Awarded

Crude Lines

Continental Pipe Line Company has awarded contract to Jim J. McCormick & Company, Wichita Falls, for construction of 16 miles of 4- and 6-inch pipe line in the Wichita Falls, Texas, vicinity.

Service Pipe Line Company has announced its plans to build a new 14-mile gathering system to handle the recently discovered oil in the Tioga, North Dakota, vicinity.

The Texas Pipe Line Company has awarded a contract for the construction of more than 300 miles of pipe line to the Houston Contracting Corporation, Houston. The job includes 220 miles of 22-inch line to be built from Houma, La., to Port Arthur, Texas, and 31 miles of 12-inch line from Cocodrie, La., to Houma. Also included will be about 60 miles of gathering system ranging in size from six to 10-inch in the Bay St. Elaine, Lake Barre, Lake Pelto, and Caillou Island fields in the Terrebonne Bay area of Louisiana. Pipe is expected to be available in January, 1952.

The Texas Pipe Line Company has announced that it intends to build, subject to Petroleum Administration for Defense approval, a 195-mile 16-inch line between Corsicana and Houston, Texas. The company's existing 8- and 10-inch lines between Corsicana and Humble, Texas, will be taken up and salvaged.

Natural Gas Lines

Central Kentucky Natural Gas Company has received authorization from FPC for construction of 13 miles of 20-inch line northwestward from North Means, Ky.

Cities Service Gas Company has been authorized by FPC to build 10 miles of 26-inch replacement pipe line from the Welda station, Franklin County, to the Ottawa station, Franklin County, Kans.

El Paso Natural Gas Company has been given final FPC approval to build proposed pipe line facilities. The plans call for 11.5 miles of 4-inch, 4.5 miles of 12-inch, and 31 miles of 10- and 16-inch pipe line in the vicinities of Phoenix, Chandler City and Mesa, Ariz.

El Paso Natural Gas Company has been given FPC permission to construct 10.4 miles of 30-inch main line loop and 36 miles of field lines. Also permitted by the same order will be the installation of 37,160-hp in new and existing main line stations, and 18,910-hp in field stations.

Gas Lateral Company has made application to FPC for permission to lay 6.8 miles of 8-inch line from Texas Illinois Natural Gas Pipeline Co.'s line near Hoffman, Ill., to Illinois Power Co's system in Centralia, Ill.

Glacier Gas Company has applied to FPC for permission to build a 626-mile pipe line system in the Pacific Northwest. The system would consist of: 285 miles of 20-inch to run from the International boundary northeast of Kalispell, Mont., to Spokane, Wash.; 120 miles of 16-inch from Spokane to Hanford, Wash.; 91 miles of 8-inch line from Spokane to Lewiston, Idaho; and 130 miles of 12-inch from Spokane to the international boundary south of Trail, B. C., Canada.

Iowa-Illinois Gas and Electric Company has temporary authorization from FPC to build 41 miles of 10-inch pipe line from Natural Gas Pipeline Company of America's line in Washington County, Iowa, to Cedar Rapids. That authorization is an examiners decision which is subject to review by the Commission.

Kansas-Nebraska Natural Gas Company, Inc., has been given authorization by FPC to construct a total of 117 miles of pipe line in Nebraska and Colorado, which will increase the company's system capacity by 18.4 million cubic feet of gas per day to a new total of 182.6 million cubic feet daily.

Michigan Gas Storage Company has been given permission by FPC to lay 30 miles of 26-inch loop lines on the Muskegon River-Freedom Junction line between Lainsburg and Mt. Pleasant Junction.

New York State Natural Gas Corporation has made application to FPC for permit to build 104.7 miles of loop lines on its main carrier in Westmoreland, Armstrong, Tioga and Potter counties, Penn., and Wyoming, Onondaga and Cayuga counties, N. Y. Also asked for was additional 2420-hp in Westmoreland and Tioga counties, Penn.

Ohio Fuel Gas Company has awarded contract to Sheehan Pipe Line Construction Company, Tulsa, for the laying of 25 miles of 20-inch line from the Howell station to Xenia, Ohio.

Southern California Gas Company and **Southern Counties Gas Company** have applied to FPC for permission to construct 39 miles of 30-inch loop lines from Whitewater, Calif., eastward, and six miles of 30-inch loop from the Calif.-Ariz. border to Blythe, Calif., compressor station, and the addition of 3520-hp at the Blythe station. This was an amended application. The original asked for 81 miles of 30-inch loops instead of 39.

Southwestern Virginia Gas Transmission Company has received FPC authority to proceed with construction of 16.8 miles of pipe line from Transcontinental's system, just north of N. C.-Va. border, to the company's facilities in Martinsville, Va.

Texas Eastern Transmission Corporation recently awarded the final three contracts for pipe laying and remaining river crossing contracts on its Koscuisko, Miss., to Connellsville, Penna., line. Jobs 8, 9, and 10, from the Ohio River near Portsmouth, Ohio, to near Connellsville, a total of 217 miles, were awarded to Anderson Bros. Corporation of Houston. Williams Bros. Company, Tulsa, received contracts for crossings of Hocking, Muskingum, Monongahela, and the Ohio-W. Va. crossing of the Ohio River. Pentzien, Inc., Omaha, was awarded contract for a crossing under the Ohio River near Portsmouth.

Texas-Ohio Gas Company has petitioned FPC for authorization to construct a 1350-mile 30-inch gas pipe line from Hidalgo County, Southwestern Texas, to Spencer, W. Va. The system would have 13 stations with a total of 140,000-hp and would cost almost $185 million. Initial capacity would be 330 million cubic feet daily and ultimate would be 650 million.

Union Gas & Electric Company has awarded contract for 33 miles of 8-inch pipe line between a point near Farmer City, Ill., Piatt County, and Bloomington, Ill., to Contracting & Material Company, Evanston.

United Gas Pipe Line Company awarded contract to River Construction Corporation, Ft. Worth, for the laying of 120 miles of 20-inch pipe from Orange to Houston, Texas. Work on this job is expected to get underway about Dec. 1.

West Texas Gas Company applied to FPC for permission to construct 32.5 miles of loop lines in Potter and Randall counties, in the Texas Panhandle. Also requested was permit to install additional 2010-hp in existing compressor stations.

Projects Starting

Crude Lines

Kaw Pipe Line Company has started right-of-way work for 13.5 miles of 12-inch line in the vicinity of Susank, Kans., and six miles of 8-inch in Ellinwood, Kans., vicinity. The Jayhawk Construction Company, Inc., Great Bend, Kans., has the contract for both lines.

Service Pipe Line Company has started construction of 18.5 miles of 16-inch pipe line between Raytown and Sugar Creek, Mo. Sheehan Pipe Line Construction Company is doing the job and expects to complete about the first of December.

Simrall Corporation has started 34 miles of 4- and 6-inch line running from Rose City to Beaverton, Mich. Mahoney Contracting Company, Lansing, has the job which also includes take-up of 15 miles of pipe between Gladwin and Beavertown.

Standard Oil Company of California has started construction of 112 miles of 4- through 12-inch gathering system in the Bakersfield, Calif., area. Engineers Limited Pipeline Company, San Francisco, holds the contract for the project.

Product Lines

Socony Vacuum Oil Company, Inc., White Eagle Division, has just started the take-up, recondition, and re-lay of 175 miles of 6-inch pipe between Augusta and Kansas City, Kans. Ray L. Smith & Sons, Inc., El Dorado, Kans., are contractors on the job.

Standard Oil Company of Ohio has started 17 miles of 6-inch line from Sohio's new terminal west of Toledo to Toledo, Ohio.

The line is being laid by Wabash Contracting Company, Inc., Centralia, Ill.

Natural Gas Lines

Consolidated Gas Company has begun construction of 30 miles of 10-inch pipe line in the Duncan, Okla., vicinity. Jim J. McCormick & Company is doing the job.

Cumberland and Allegheny Gas Company has started work on 35 miles of 10-inch line from Mountain Lake Park, Md., to Manufacturers Light & Heat Co's system on Penna.-W. Va. state line in Monongalia County, W. Va. Britton Contracting Company, Inc., Washington, Penn., holds the contract.

Houston Pipe Line Company has had Brown & Root, Inc., Houston, start work on 26 miles of 18-inch gas pipe line in Harris County, Upper Texas Coast.

Michigan Gas Utilities Company started work on 65.2 miles of 8- and 10-inch line from Panhandle Eastern's system near Marshall to Sturgis, Mich. Somerville Construction Company, Ada, Mich., is laying the line.

Pan American Gas Company had Brown & Root, Inc. start work early in November on a 10-mile crossing of Galveston Bay, Upper Texas Coast, with 18-inch pipe. This crossing is at one end of Pan American's new Winnie to Texas City pipe line.

Texas Illinois Natural Gas Pipe Line Company was scheduled to start late in November on 54 miles of 22-inch and 20 miles of 16-inch line from vicinity of Freer, Southwestern Texas, to Robstown. Massey Pipe Line Construction Company, Corpus Christi, holds the contract for the line.

Wisconsin Natural Gas Company in late October started 17 miles of 8-inch line between Jamesville and Fort Atkinson, Wis. Sheehan Pipe Line Construction Company is laying the pipe.

Projects Completed

Crude Lines

Gulf Refining Company was scheduled to complete early in November, 88 miles of 14-inch line from Lumberton, Miss., to Mobile, Ala. Anderson Bros. Corporation did the construction.

Service Pipe Line Company by the end of November expected to complete 22.8 miles of 8-inch line from North Sage Spring Creek field, Natrona County, to the company's line at South Cole Creek field, Converse County, Wyo. The line was constructed by Vaughn and Taylor Construction Company, Inc., Wichita Falls.

Texaco Exploration Company completed 41 miles of 8-inch line from the Wizard Lake field to Edmonton, Alberta, Canada. The line will carry crude to McColl Frontenac's refinery and to the Interprovincial line. Banister Construction, Ltd. & Piggott Construction, Ltd., Edmonton, built the pipe line.

Product Lines

Plantation Pipe Line Company has just completed a new line running parallel to its existing system from Baton Rouge, La., to Charlotte, N. C. The new project consists of 432 miles of 18-inch from Baton Rouge to Bremen, Ga., and 275 miles of 14-inch on to Charlotte. Williams Bros. Corporation, Tulsa, laid all of the pipe.

Natural Gas Lines

Colorado Interstate Gas Company has completed 215 miles of 20-inch pipe line from the West Panhandle gas field, Texas Panhandle, to the firm's Lakin-to-Denver line at Kit Carson, Colo. The job was done by R. H. Fulton & Company, Lubbock, Texas.

Manufacturers Light & Heat Company completed 144 miles of 16-inch line from the Leidy gas field, near Renova, Clinton County, Penn. to Pittsburgh. Britton Contracting Company, Inc., was the contractor.

New York State Natural Gas Corporation has completed 39.1 miles of 20-inch loop lines from the company's compressor station in Potter County, Penn. to the line between Livingston and Monroe counties, N. Y. Work was done by Pipeline Construction & Drilling Company, Camp Hill, Penn.

United Fuel Gas Company has completed 32 miles of 20-inch line between Nitro and Clendenin, W. Va. H. L. Gentry Construction Company, Jackson, Mich., held the contract.

CORRECTION

The following footnote to the article, "New Seal Speeds Road Crossing," which appeared in WORLD OIL's November Pipe Line Issue, was inadvertently omitted. "Patent on this process is pending."

X A.P.I. COUPLINGS FOR OIL FIELD USE

EVERY SIZE AND TYPE FROM *ONE* SOURCE

LINE PIPE COUPLINGS A.P.I.
⅛" to 12"—Seamless and Special Processed—Black or Galvanized

PLAIN TUBING COUPLINGS A.P.I.
1" to 3"—Seamless

EXTERNAL UPSET TUBING COUPLINGS A.P.I.
¾" to 3½"—Seamless

CASING COUPLINGS A.P.I.
4½" to 13⅜"—Long or Short

HYDRAULIC COUPLINGS
⅛" to 3"—Seamless

REAMED AND DRIFTED A.I.S.I.
¾" to 12"—Seamless or Spl. Processed

DRIVE PIPE COUPLINGS
⅜" to 12"—Seamless or Spl. Processed

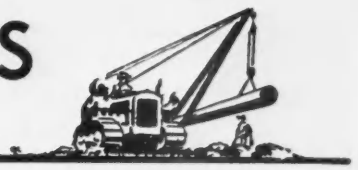
Consult Our Nearest Quick Service Sales Office:

Albany, N. Y.—Albert L. Becker, 434 Clinton Ave.
Baltimore—Ted Barto, 2301 N. Charles St
Boston—Wm. F. Bennett, 24 Spring St., Somerville
Buffalo—W. E. Spencer & Assoc's, 241 S. Elmwood Ave
Chicago—Harry A. Jay, 122 So. Michigan Ave.
Denver—Earl H. Jones & Co., 1863 Wazee St
Detroit—Thomas L. Osberger, 19451 Livernois Ave
Erie, Pa.—R. J. Maggi, Box 711
Houston—Henry H. Paris Distributor, Inc., Box 932
Kansas City, Mo.—Wm. J. Hebenstreit, 3122 Coleman Rd.
Los Angeles—James A. Riordan Co., 1400 Santa Fe Ave.
Minneapolis—Lin J. Krause, 200 Lumber Exchange
Newark, N.J.—Murray Eskin, Industrial Office Bldg.
New York—Henry Stein, 50 Cliff St.
Philadelphia—J. W. Worthington, 401 N. Broad St.
Portland, Ore.—Earl H. Jones & Co., 1233 NW 12th Ave.
Richmond, Va.—P. C. Abbott & Co., Mutual Bldg.
San Francisco—Earl H. Jones & Co., 1150 Folsom St.
Seattle—Earl H. Jones & Co., 619 Second Ave.

FACTORY 'PHONE: WOODSDALE 3296

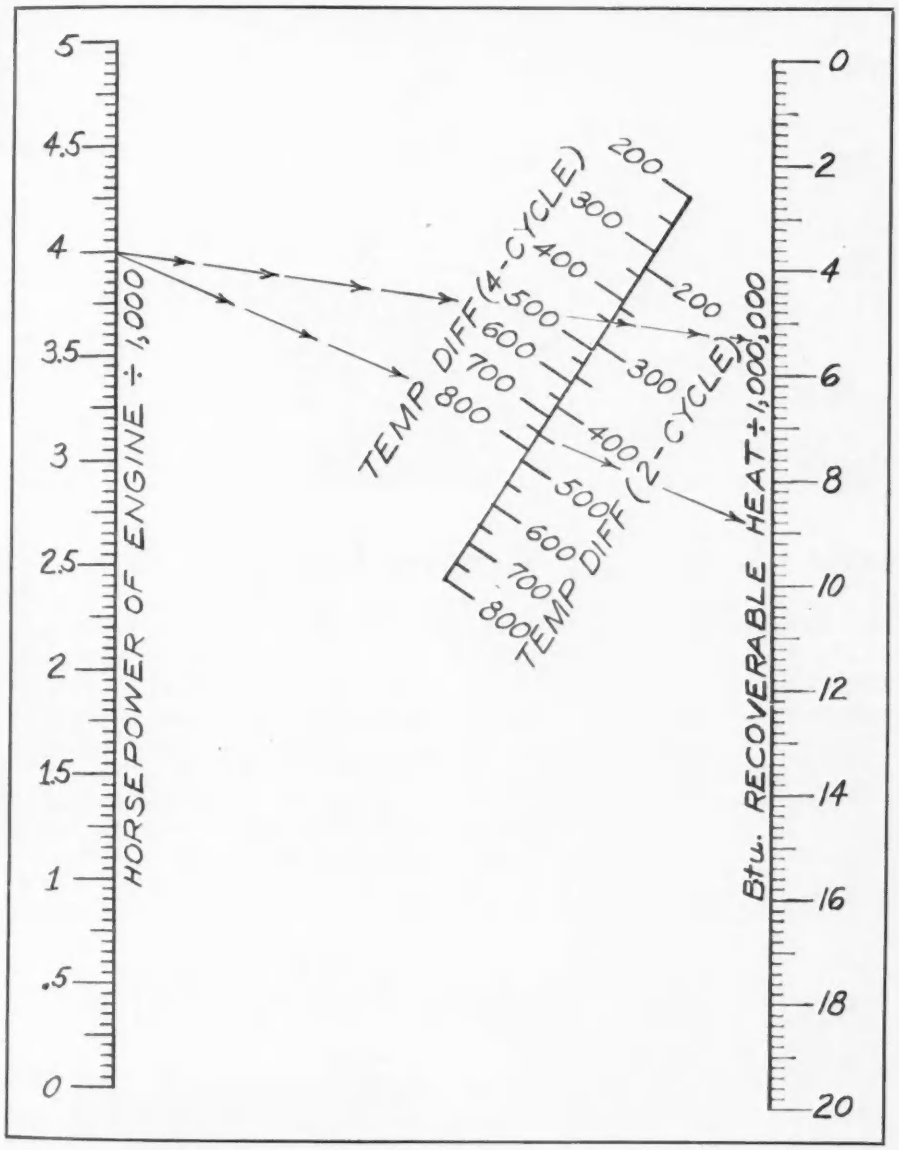
WHEELING MACHINE PRODUCTS COMPANY
ELM GROVE STATION **WHEELING, W. VA.**

How to do it! PIPE LINE HINTS



$10 is paid for each illustrated acceptable contribution. Mail to The Editor, WORLD OIL, P. O. Box 2608, Houston 1, Texas

HOW TO—Estimate Heat Recovery



Pump stations that use diesel engines for generator or pump drive can recover heat from engine exhaust gas and use it to generate steam or heat water for plant use. A fuel saving which justifies the additional investment needed can usually be made, making waste-heat boilers feasible for pump station use. This chart, based on an equation given by the Diesel Engine Manufacturers' Association, permits easy computation of heat recoverable from 2- and 4-cycle diesel engines. It is used like this:

Example: How much heat is recoverable from a 4000-hp 4-cycle diesel engine when average temperature of exhaust gas leaving engine is 700° F. and exit temperature of gas from heater is 250° F.?

Solution: Enter the chart at the left and from 4000 hp draw a straight line through 700° — 250° = 450° F. on the upper portion of the central sloping scale. Continue this straight line until it intersects the righthand scale and read 5,400,000 Btu. per hour, heat recoverable.

Example: What would the heat recovery be if this engine were a 2-cycle unit instead of 4-cycle?

Solution: Solve as before but use the lower portion of the central sloping scale. Heat recoverable is found to be 9 million Btu. per hour.

Here are several facts worth noting about exhaust-heat recovery. The chart gives only an estimate of heat recoverable. For exact values the engine manufacturer should be consulted. When estimating heater exit temperature the exhaust gas must be maintained at 250° F. or higher to prevent corrosion which is caused by condensation of the exhaust gas.

A greater amount of heat is recovered when heating water than when generating steam. Also, more heat is recovered when generating low-pressure steam than when making high-pressure steam because temperature difference between water and gas is greater.

To find approximate amount of steam that can be generated, pounds per hour, divide heat recoverable, Btu. per hour, by 1000.

HOW TO—Guard Water Line Against Surging

Difficulties in maintaining water lines against pressure surges resulting when gate valves on main lines were closed rapidly were eliminated when pump station operators installed a pressure relief valve on the system between water pump and tank.

Before the relief valve was installed, frequent breaks occurred at the couplings in a water main running from high pressure centrifugal pumps to water tank, despite the air chamber in the system. Operators were forced to close gate valve on the system slowly in order to avoid the hammer effect of the surge.

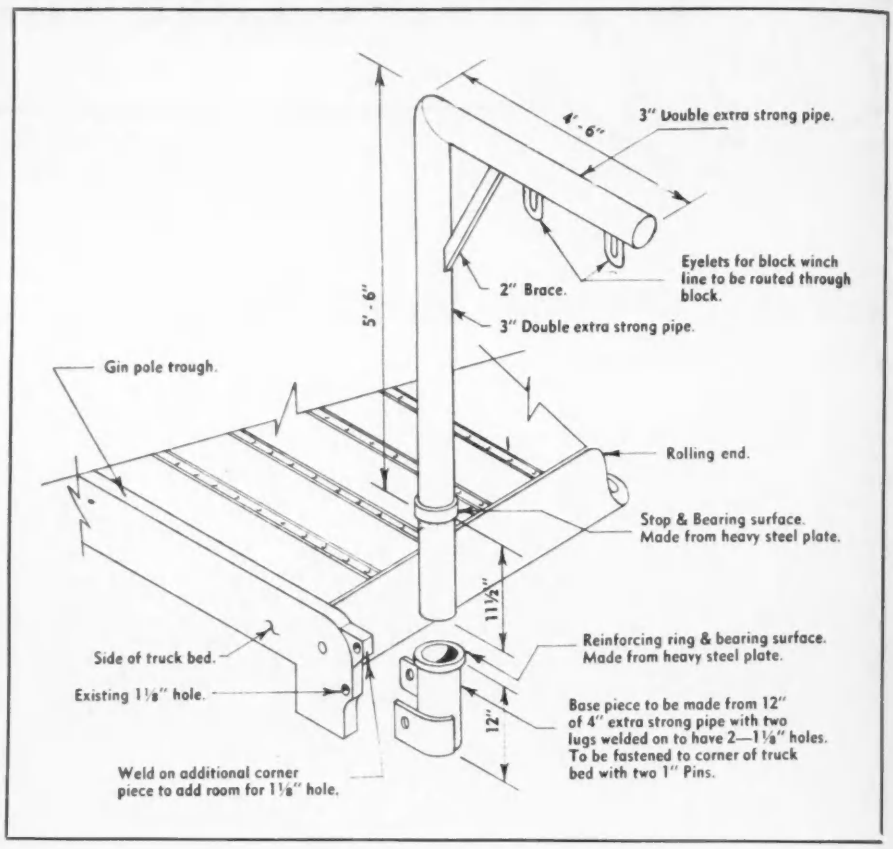
No trouble with the system has arisen since installation of the pressure relief valve.

PERSONAL SUPERVISION

on construction of your pipe lines, water lines, sewer lines, excavations, salt water disposals

Modern Equipment • Efficient Personnel
Financial Stability

TROJAN
CONSTRUCTION CO.
INCORPORATED
1416½ N. ROBINSON
OKLA. CITY, OKLA. PH. 2-7696
WAREHOUSE PHONE 6-1430


4'-6"
3" Double extra strong pipe.
Eyelets for block winch line to be routed through block.
2" Brace.
5'-6"
3" Double extra strong pipe.
Gin pole trough.
Rolling end.
Stop & Bearing surface. Made from heavy steel plate.
11½"
Reinforcing ring & bearing surface. Made from heavy steel plate.
Side of truck bed.
Existing 1⅛" hole.
12"
Base piece to be made from 12" of 4" extra strong pipe with two lugs welded on to have 2—1⅛" holes. To be fastened to corner of truck bed with two 1" Pins.
Weld on additional corner piece to add room for 1⅛" hole.

HOW TO—Make Boom for Truck

A demountable loading boom and mast which can be easily attached to a truck bed to save labor and facilitate truck loading can be fabricated in about half a day using about $35 worth of material.

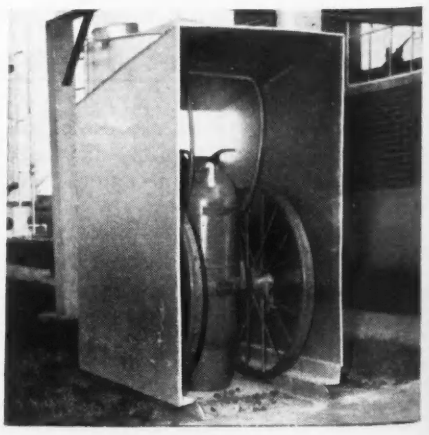
The base piece which supports the upright boom is made by welding lugs onto a 12-inch length of four-inch extra heavy pipe. The lugs are drilled to fit corner pieces welded to the truck bed frame as shown.

The upright boom is made of extra-heavy three-inch pipe braced as shown. The two eyelets on the horizontal member are cut from half-inch steel and welded to the frame to support blocks which may be used to raise a load. After the load is hoisted to the level of the truck bed, the boom can be swung around and the load stowed on the truck.

HOW TO—House Fire Extinguisher

Using scrap steel, one company fabricated a small shed for a wheel-mounted fire extinguisher to protect it from sun and rain.

A small concrete pad served as a support for the fire extinguisher as well as the steel plate shed. The flat plates were cut and welded together without any framing members, and set upon runners of scrap angle iron. The bottom runners were bolted to the concrete pad to prevent overturning.



37th YEAR
SERVING THE OIL FIELD AND ASSOCIATED INDUSTRIES

IF WE DON'T HAVE IT—
WE WILL MAKE IT

FIRST-CLASS MACHINE SHOP
• MODERN MECHANIZED
GRAY IRON FOUNDRY

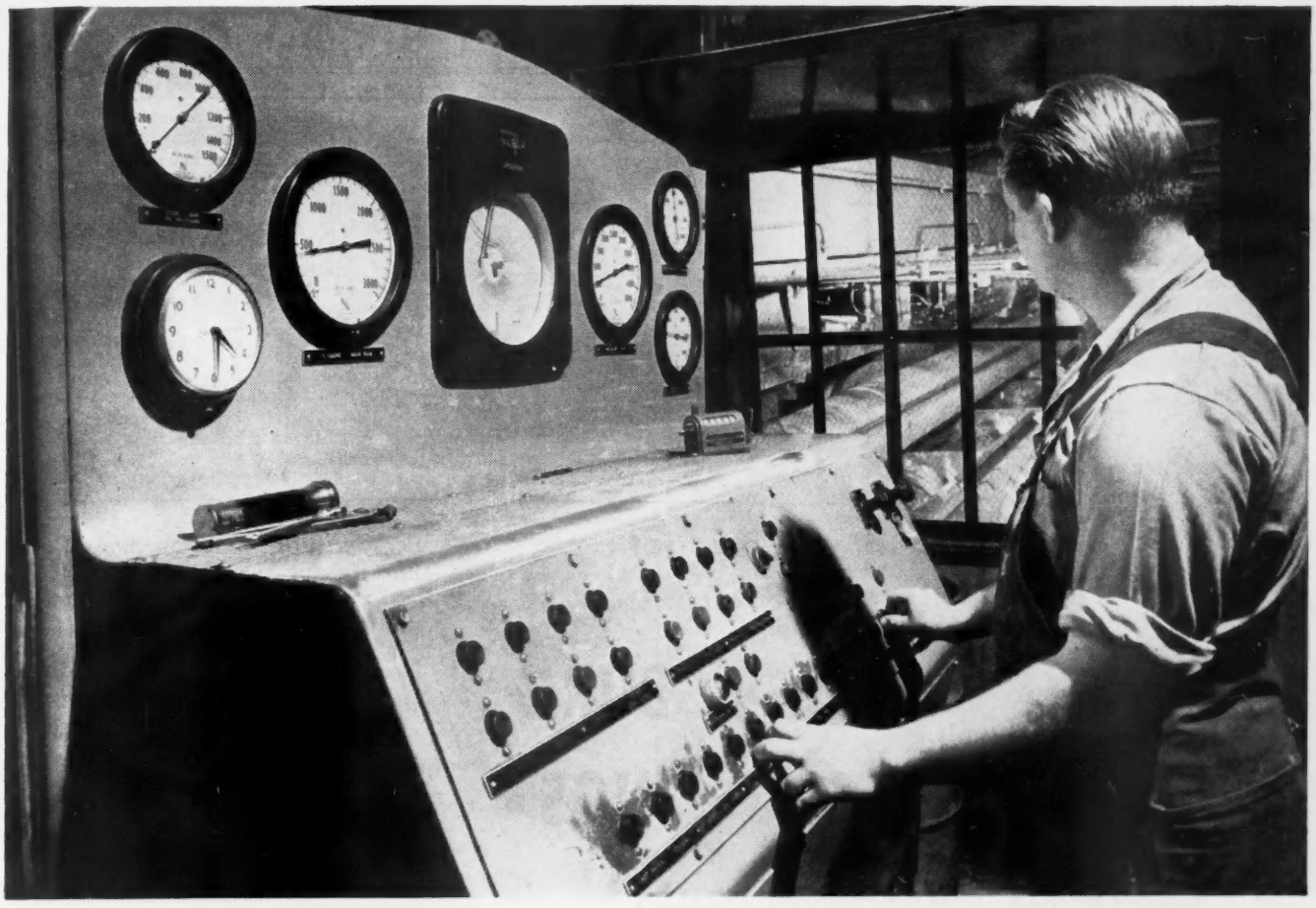
WE SPECIALIZE IN . . .
★ REBUILDING AND TESTING ENGINES • COMPRESSORS AND PUMPS
★ NEW AND REBUILT OIL AND GAS FIELD SUPPLIES AND EQUIPMENT
★ REPAIR AND REPLACEMENT OF ALL INDUSTRIAL EQUIPMENT

SUPPLIES · EQUIPMENT · REPAIRS

WE can FILL YOUR NEEDS

WRITE OR WIRE US, TODAY
PHONES 874 - 875

ACME FOUNDRY & MACHINE CO.
COFFEYVILLE • KANSAS



He's doing 3 jobs for you

This man is operating equipment that does three important things to assure you of better Basalt-Kaiser line pipe:

It expands line pipe hydraulically within restraining dies to extremely accurate diameter, concentricity and straightness.

It strengthens line pipe through cold working—which means requirements of high yield strength specifications are met.

It tests line pipe with hydraulic pressure after the dies are opened. And while under pressure the pipe is struck blows of measured impact along the seam to further test the soundness of the weld.

Kaiser Steel pipe is being produced to conform to latest API specifications in diameters from ½ inch to 30 inches, and in lengths up to 55 feet. Shipping points are Fontana, and Napa, California.

It's good business to do business with

Kaiser Steel

KAISER STEEL PIPE SPECIFICATIONS • All pipe manufactured to latest A.S.T.M. and A.P.I. specifications

Type	Diameter	Length	Wall Thickness	Shipping Point
Continuous Weld—Threaded and Coupled	½" to 4" nominal I.D.	Uniform 21'	Standard	Fontana, Calif.
Continuous Weld—Plain End	2⅜" to 4½" O.D.	Up to 40'	Standard	Fontana, Calif.
Electric Resistance and Fusion Weld—Plain End	8⅝" to 20" O.D.	Up to 40'	.188" to .500"	Napa, Calif.—Basalt-Kaiser
Electric Resistance Weld—Plain End	5⅝" to 12¾" O.D.	Up to 55'	.188" to .400"	Fontana, Calif.
Electric Fusion Weld—Expanded—Plain End	22" to 30" O.D.	Up to 40'	.188" to .500"	Napa, Calif.—Basalt-Kaiser

Prompt, dependable delivery at competitive prices • KAISER STEEL CORPORATION Los Angeles, Oakland, Seattle, Portland, Houston, Tulsa, New York

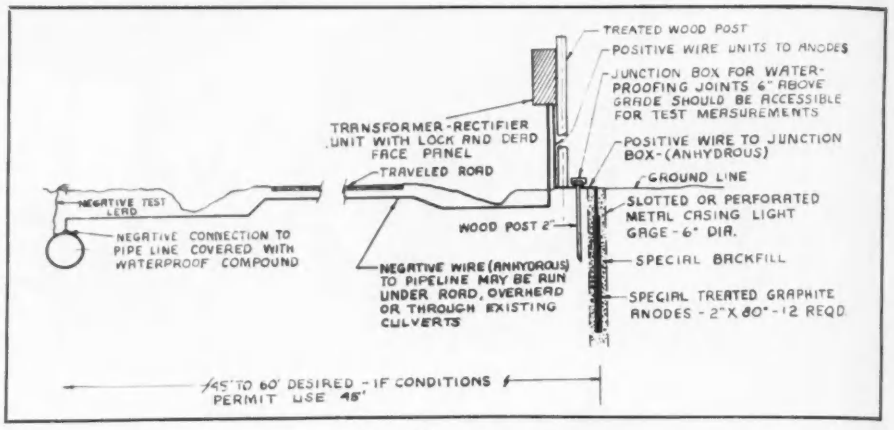
HOW TO—

Control Corrosion In Salt Marsh Area

Leakage in a 2500-foot section of 24-inch pipe line located in a salt brine marsh was reduced by installing cathodic protection utilizing specially treated graphite anodes, and current from nearby power system.

Prior to installation of the cathodic protection system, the company was experiencing about 30 to 40 leaks per year in the short section of pipe line. In the two years following installation of the system, only three pin hole leaks have appeared. This remarkable reduction in leaks was accomplished by installing the graphite anodes approximately 200 feet apart in a line running parallel to the pipe line. At center of the installation one transformer-rectifier unit with lock and dead face panel supplies a positive connection to all the anodes and a negative wire which extends 40 feet under the road to the pipe line on the opposite side.

The direct current from the transformer-rectifier unit is impressed upon the anodes and radiates through the soil, which acts as the electrolyte, to the metal pipe. The current enters the metal surfaces of the pipe and opposes electro-chemical action of corrosion.

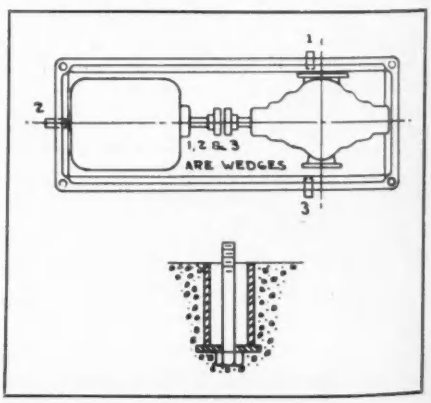

TREATED WOOD POST
POSITIVE WIRE UNITS TO ANODES
JUNCTION BOX FOR WATER-PROOFING JOINTS 6" ABOVE GRADE SHOULD BE ACCESSIBLE FOR TEST MEASUREMENTS
TRANSFORMER-RECTIFIER UNIT WITH LOCK AND DEAD FACE PANEL
POSITIVE WIRE TO JUNCTION BOX-(ANHYDROUS)
TRAVELED ROAD
GROUND LINE
NEGATIVE TEST LEAD
SLOTTED OR PERFORATED METAL CASING LIGHT GAGE - 6" DIA.
WOOD POST 2"
NEGATIVE CONNECTION TO PIPE LINE COVERED WITH WATERPROOF COMPOUND
SPECIAL BACKFILL
NEGATIVE WIRE (ANHYDROUS) TO PIPELINE MAY BE RUN UNDER ROAD, OVERHEAD OR THROUGH EXISTING CULVERTS
SPECIAL TREATED GRAPHITE ANODES - 2" X 60" - 12 REQD
45' TO 60' DESIRED - IF CONDITIONS PERMIT USE 45'

HOW TO—

Facilitate Setting Pumps and Engines

Installing anchor bolts in metal pipe sleeves at a slightly higher elevation than called for on prints, saves money and time in setting pumps, compressors and engines.

The pipe sleeve provides room for



There's a good way to get acquainted with

HARRISBURG COUPLINGS

too!

If you haven't yet "made the acquaintance" of *Harrisburg Seamless Steel Pipe Couplings* in your business . . . isn't it about time you got to know the superior features of this fine product?

It's easy. All you have to do is call in the Harrisburg distributor nearest you, and let him show you samples . . . go over these couplings point by point . . . and quote you prices and delivery. Then *you* decide!

Among other things, *Harrisburg Couplings* are made to A.P.I. and A.I.S.I. specifications . . . in A.P.I. casing, A.P.I. line, drive, water well, and other types. Ask your Harrisburg distributor. Or write the factory for full details.

Consult our Oil Country Distributors or write Harrisburg.

SEE OUR CATALOG IN THE COMPOSITE CATALOG

HOUSTON 1
Henry H. Paris Distributor, Inc.
LOS ANGELES 58
Howard Supply Company
TULSA 1
W. C. Norris Manufacturer, Inc.

HARRISBURG STEEL CORPORATION
Harrisburg 8, Pennsylvania

Custom-Built Quality Products in Quantity
98 YEARS IN PENNSYLVANIA'S CAPITAL

BEAVER 26-R

the only tool of its kind that . .

. . . cuts either standard "taper" or electric "straight" conduit threads by a simple adjustment.
. . . has "radio" dial size-setting. Dies can be removed in a few seconds FROM THE OUTSIDE without use of tools.
. . . is fully-adjustable and easy-working. The only 1 to 2-inch pipe threader that cuts standard, oversize and undersize threads of uniform standard length.

The Beaver 26-R uses one set of dies to thread four sizes—1, 1¼, 1½ and 2-inch. It is fully-adjustable for oversize or undersize threads to compensate for variation in fittings. There's a cam-type universal self-centering chuck, too, which centers the pipe accurately and insures straight pipe lines. Yet, "drip threads" may be cut when desired for heating lines. **Your customers benefit from the advantages of Beaver 26-R. Why not tell them about it today?**

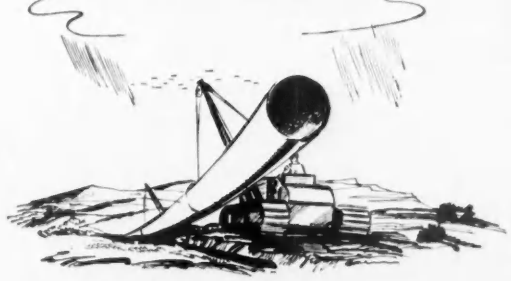
SEND FOR BEAVER CATALOG NO. 51. Address Beaver Pipe Tools, Inc., 254-300 Dana Avenue, Warren, Ohio, U. S. A.

BEAVER PIPE TOOLS

254-300 DANA AVENUE **WARREN, OHIO, U. S. A.**

PIPELINE **PRICE** CONSTRUCTORS

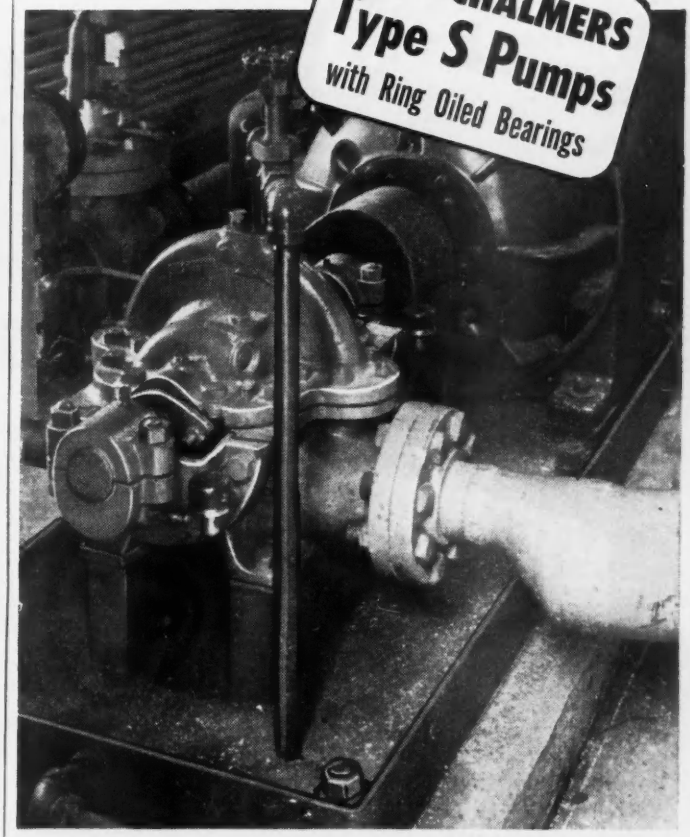
America's Foremost Pipeline Constructors



H. C. PRICE CO.

PHILADELPHIA • BARTLESVILLE • NEW ORLEANS

ALLIS-CHALMERS Type S Pumps with Ring Oiled Bearings



Proven Performance

PUMPING LUBE OILS, GAS OILS AND LIGHT HYDROCARBONS

DESIGNED TO OIL COMPANY SPECIFICATIONS, Allis-Chalmers Type S Pumps are built to handle non-corrosive and corrosive lube oils, gas oils and light hydrocarbons. They can be serviced quickly and easily by removing the rotating element without disturbing the suction piping, discharge piping or the prime mover. Check these features:

- **High efficiency and balanced hydraulic design.**
- **Ring oiled ball bearings assure constant lubrication without foaming.**
- **Suction and discharge flanges 250 lb thick drilled to 125 lb dimensions.**
- **Extra long stuffing box assures adequate packing — plenty of room for easy access to packing.**
- **Smothering type bronze bushed glands, mechanical seals or water cooled stuffing boxes optional.**
- **Long heavy casing support dampens vibration and reduces distortion.**
- **Low cost replaceable parts at all points of wear protect casing and shaft.**

Write *TODAY* for complete information.

CANADIAN ALLIS-CHALMERS (1951) LIMITED
P.O. BOX 37, MONTREAL, QUEBEC

A-C ALLIS-CHALMERS

MADE IN CANADA 51-CAL-26

CANADIAN ALLIS-CHALMERS

springing the bolts to fit the pattern of holes in the pump or engine base, and also allows the entire pump to be shifted slightly for alignment purposes. The added elevation of anchor bolts allows for error and adjustment; once the pump has been grouted, excess length can be cut off.

The pipe sleeve can be made from scrap pipe and steel plate. The pipe itself should be sized according to the size of the anchor bolt, with the inside diameter at least three times that of the bolt diameter. The length of the sleeve should be about 12 bolt diameters, although a longer sleeve is all right if foundation dimensions provide enough space.

Diameter of the steel plate at the bottom of the sleeve should exceed that of the pipe to give added strength to the bond with concrete foundation. Preferably, the plate should be welded to the anchor bolt.

Once the pump has been set and leveled with steel wedges, the pipe sleeves should be filled with cement-sand grout and allowed to set for a minimum of 24 hours before the pump or engine base is grouted. This allows the concrete inside the sleeve to take its initial shrinkage before the pump itself is grouted.

PIPELINES
are not
SIDELINES
with WILLIAMS BROTHERS!

★

Years of experience have specialized our men, methods, and equipment—with only one purpose . . . BETTER PIPELINES

WILLIAMS BROTHERS

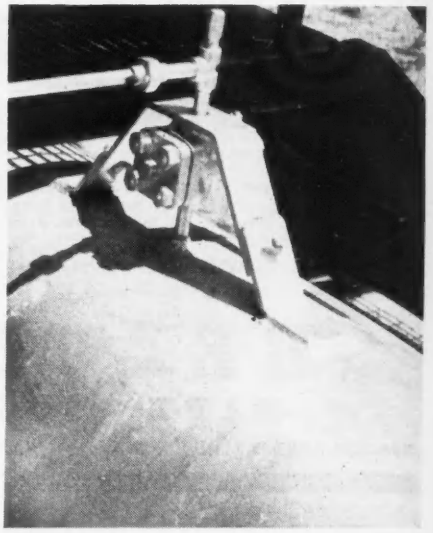
ENGINEERS
CONTRACTORS
Oil—Gas—Products—Water
Pipelines and Pumping Stations

WILLIAMS BROTHERS
TULSA
NEW YORK
ATLANTA
LOUISVILLE

CARACAS • MARACAIBO • BOGOTA • LA PAZ

HOW TO—

Strengthen Valve on High Pressure Line



Mechanical strength of small diameter pipe nipples originating on high pressure lines can be supplemented by proper bracing to overcome the hazard of accidental blows and repeated stresses applied through opening and closing of attached high pressure valve.

While the small diameter pipe offers more than ample strength to resist internal pressure, it cannot withstand even the lightest of blows applied through the fulcrum of pipe legs. When the pipe nipple between the valve and the header is broken the compressor station must be shut down and high pressure lines blown down in order to effect repairs.

The hazard can be minimized by installing demountable bracing above the high pressure valve as shown. Straps three-inches wide and one-fourth inch thick were heated and bent 45 degrees, then welded to the pipe as illustrated. A center section, made from similar strap 18 inches long, has two 45-degree bends spaced to fit the brackets on the pipe and to provide a horizontal section atop the valve. A small diameter hole cut to fit the pipe was drilled in the center, and bolt holes were drilled to fit holes in the brackets after the valve was in place.

International Section

DON KLIEWER, SECTION EDITOR

WORLD OIL

Hughes Bit Production doubled

More than twice as many rock bits are now coming off the Hughes production line as were being produced at the close of World War II.

This high rate of production has been made possible by a plant expansion program started in 1946 to place our company in position to meet future emergency bit requirements of the industry.

As a result of this foresightedness, Hughes has been able to keep pace with the unprecedented and unforeseen bit demands of the past two years.

Here, again, is proof of the fact that you can depend upon Hughes to anticipate your rock bit requirements.

HUGHES
TRI-CONE
ROCK BITS

when the mud goes down

..and DOESN'T come back

FIBERTEX A specially prepared fibrous material which, in careful tests, has proved superior to all other fibers tested. The matting or bridging effect of the fibers has walled off many types of porous or creviced formations which would have otherwise needed a cement job. Does not ferment or deteriorate in use, hence will not sour the mud. Reduces amount of preservatives needed in starch muds.

MICATEX Specially ground mica, effective by itself in mild cases of lost circulation. Often used with Fibertex in severe cases, where the combination has frequently been very successful. Does not swell or disintegrate in the mud, nor will the mica particles abrade pump liners, pistons and other parts of the mud system.

FINE MICATEX Where known mildly-porous formations exist, operators frequently add this specially sized flake mica to the mud before drilling into these zones of lost circulation. Since Fine Micatex has been ground fine enough to pass through the mud screens, it is not necessary to by-pass the shale shakers when using this product.

JELFLAKE Light, tough cellophane foil scraps, which bridge or plug many types of porous formation. Easy and clean to handle, and does not swell or disintegrate in the well fluids.

...it's time for these TESTED BAROID PRODUCTS

We won't waste your time by telling you how serious lost circulation can be—every operator knows that—or by trying to pretend that these products are sure-fire remedies for every job. You know better, since no two cases of lost circulation are ever exactly alike. But thousands of experienced operators who have used Fibertex, Micatex and Jelflake, either singly or in combination, can tell you that they *do* stop lost circulation in the great majority of cases—and do it better, faster and cheaper than anything else that can be used. And, if nothing else does the job, you have Aquagel cement which does the job in everything but actual caverns.

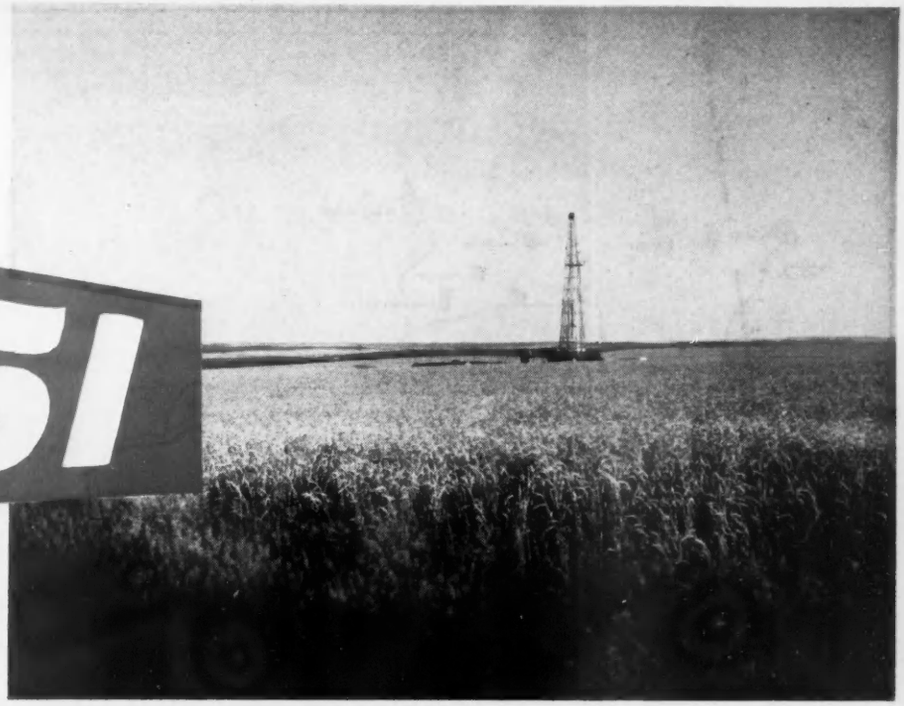
Your Baroid Service Engineer can tell you more!

Baroid

BAROID SALES DIVISION
NATIONAL LEAD COMPANY
LOS ANGELES 12 · TULSA 3 · HOUSTON 2

LOST CIRCULATION MATERIALS

1951 In Canada



Wildcat well in Drumheller area 65 miles northeast of Calgary. Terrain is typical of south plains area of Alberta.

By GILBERT M. WILSON
WORLD OIL Staff

THE Canadian oil industry is expanding at an unprecedented rate. To describe the remarkable progress it is necessary to glance back to late 1946. In that year, the infant oil industry could boast only a modest 19,000 barrels per day productive capacity, a reserve picture of only about 45 million barrels and an oil well completion rate of only 50 to 60 wells per year.

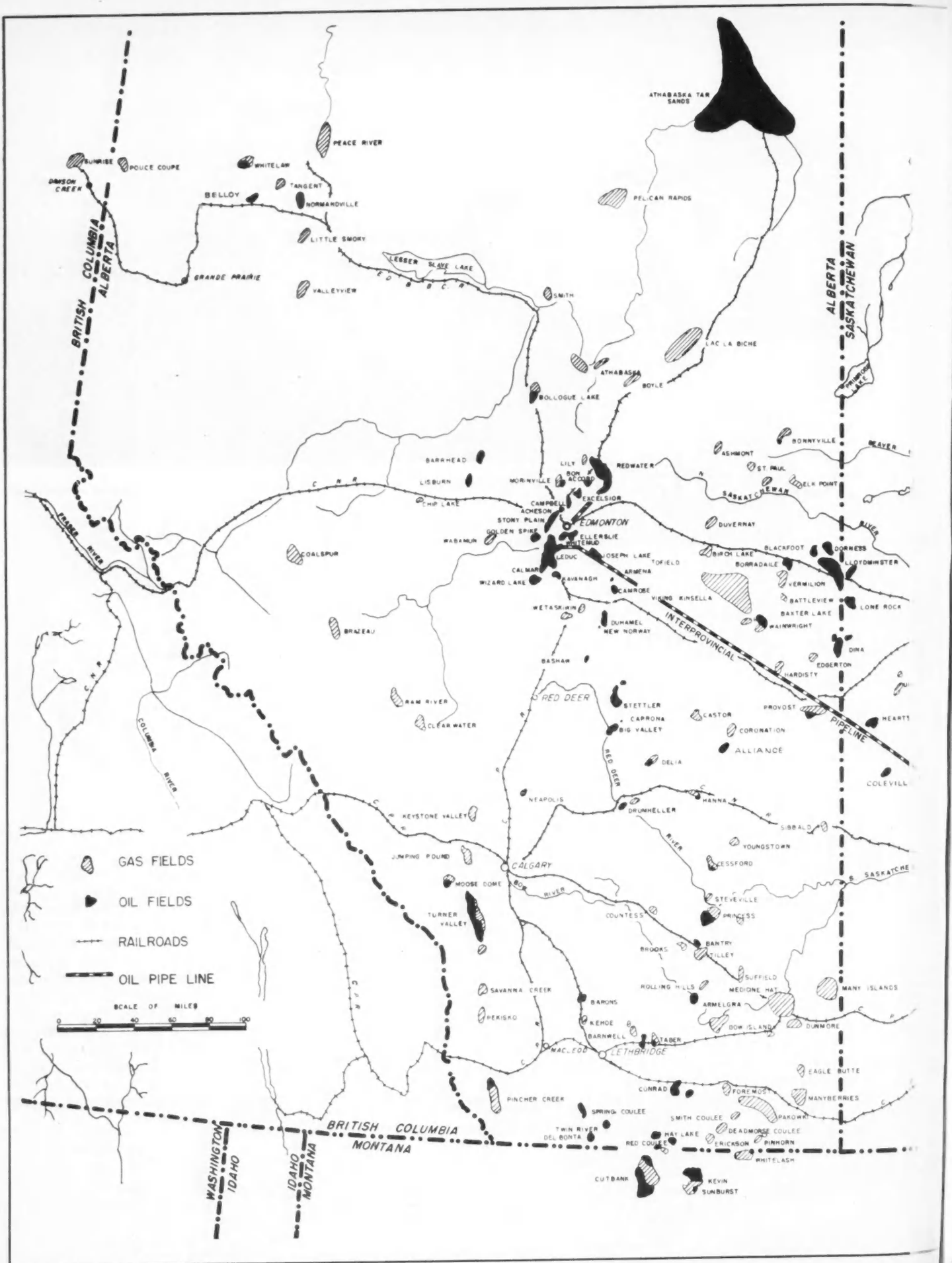
Within two years, the industry had grown mightily because of two discoveries, Leduc and Redwater, which now account for more than 1500 of the 2600-plus oil wells in Western Canada. The year 1950 saw the country well along on the road to oil supply independence, with a string of new discoveries many of which still have not been fully evaluated despite a rapidly expanding drilling and development program.

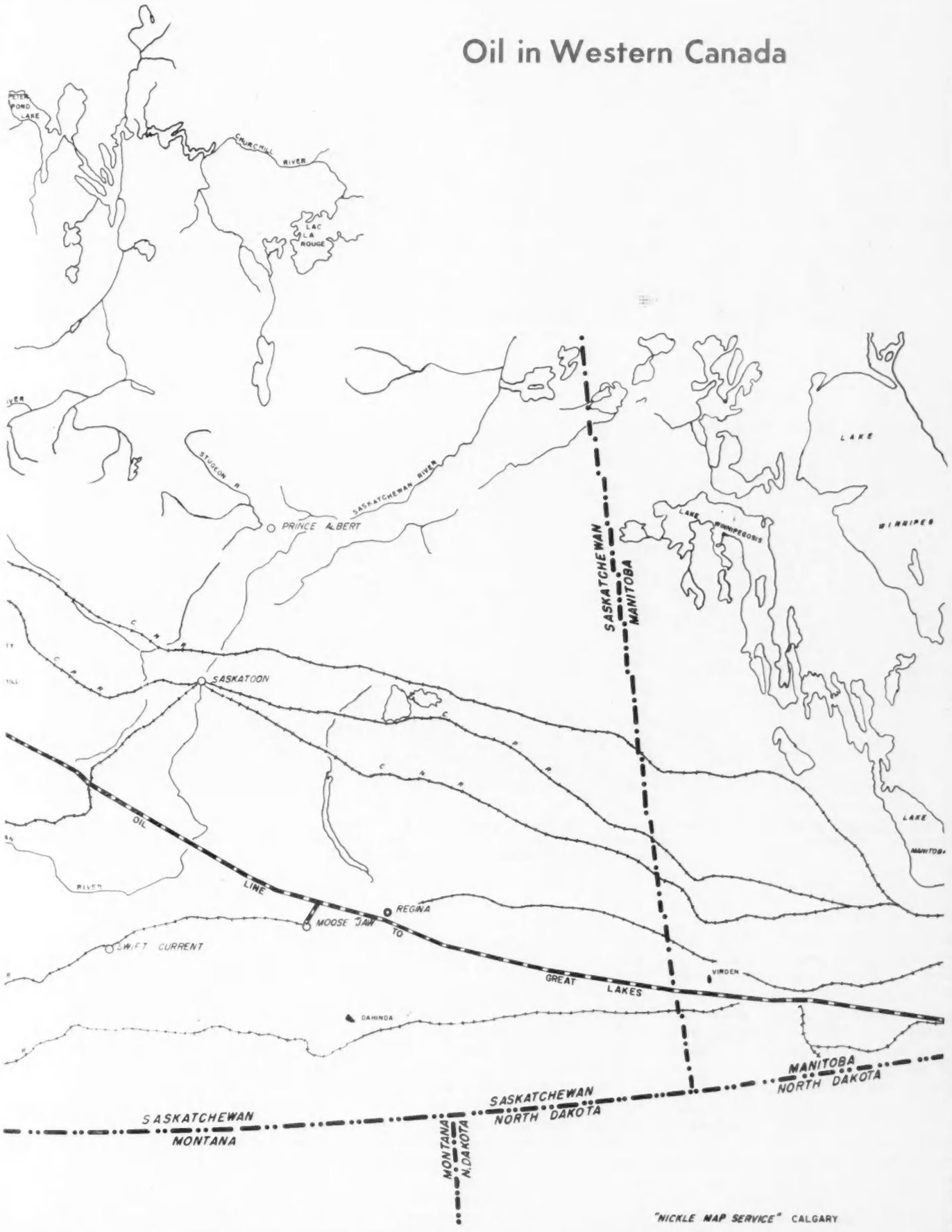
CANADA'S OIL INDUSTRY appears headed toward still more records after establishing many new ones in 1951. With more than 2600 oil wells and new discoveries, Western Canada is believed to have proven crude reserves of between 1.3 and 1.5 billion barrels, all but a small percentage of which lie in Alberta. Even these figures are expected to be revised upward as potentially significant reef and Viking sand discoveries are developed.

Curves showing the growth of almost every phase of the Canadian oil industry have been climbing steeply, (see Figure 1) and late in 1951 it was evident that the general outlook, far from even leveling out, is destined to be even brighter. Work ranging from geophysical activity to pipelining and refining is slated to reach even higher peaks. With more than 200 drilling rigs currently operating in Western Canada and with an estimated annual expenditure in excess of $215 million on exploration and development projects, there seems little doubt that the currently estimated reserves of 1⅓ billion barrels and potential productive capacity of around 200,000 barrels per day will in a few years seem as low in comparison as were the earlier figures cited for 1946.

Reef Fairway Activity

The year has seen a rapid expansion of activity along what now is being termed the Reef Fairway, a northwest-southeast tending structural basin averaging about 200 miles in width by over 1000 miles in length


ATHABASKA TAR SANDS
PEACE RIVER
SUNRISE
POUCE COUPE
DAWSON CREEK
WHITELAW
TANGENT
NORMANDVILLE
BELLOY
LITTLE SMOKY
LESSER SLAVE LAKE
GRANDE PRAIRIE
VALLEYVIEW
SMITH
PELICAN RAPIDS
LAC LA BICHE
ATHABASKA
BOYLE
BOLLOGUE LAKE
BRITISH COLUMBIA
ALBERTA
ALBERTA
SASKATCHEWAN
BARRHEAD
LISBURN
MORINVILLE
LILY
BON ACCORD
REDWATER
ASHMONT
BONNYVILLE
BEAVER
ST. PAUL
ELK POINT
SASKATCHEWAN
RIVER
CHIP LAKE
CAMPBELL
ACHESON
EXCELSIOR
EDMONTON
STONY PLAIN
WABAMUN
GOLDEN SPIKE
ELLERSLIE
INTERMUD
DUVERNAY
COALSPUR
LEDUC
JOSEPH LAKE
TOFIELD
BIRCH LAKE
BLACKFOOT
BORREADALE
DORNESS
LLOYDMINSTER
CALMAR
WIZARD LAKE
DAVENAGH
ARMENA
CAMROSE
VIKING
KINSELLA
VERMILION
BATTLEVIEW
LONE ROCK
BAXTER LAKE
WAINWRIGHT
WETASKIWIN
DUHAMEL
NEW NORWAY
INTERPROVINCIAL
PIPELINE
BRAZEAU
DINA
EDGERTON
HARDISTY
BASHAW
RED DEER
RAM RIVER
CLEARWATER
STETTLER
CAPRONA
BIG VALLEY
CASTOR
CORONATION
ALLIANCE
PROVOST
HEARTY
COLEVILLE
DELIA
NEAPOLIS
KEYSTONE VALLEY
DRUMHELLER
MANNA
SIBBALD
YOUNGSTOWN
JUMPING POUND
CALGARY
MOOSE DOME
BOW RIVER
TURNER VALLEY
COUNTESS
STEVEVILLE
PRINCESS
BANTRY
TILLEY
BROOKS
SUFFIELD
ROLLING HILLS
MEDICINE HAT
MANY ISLANDS
SAVANNA CREEK
PEKISKO
BARONS
KEMOE
BARNWELL
TABER
ARMELGRA
BOW ISLAND
DUNMORE
MACLEOD
LETHBRIDGE
EAGLE BUTTE
CONRAD
FOREMOST
MANYBERRIES
PINCHER CREEK
SPRING COULEE
SMITH COULEE
PAKOWKI
TWIN RIVER
DEL BONTA
MAY LAKE
DEADMORSE COULEE
RED COULEE
ERICKSON
PINHORN
WHITEGLASH
BRITISH COLUMBIA
MONTANA
WASHINGTON
IDAHO
IDAHO
MONTANA
CUTBANK
KEVIN
SUNBURST
GAS FIELDS
OIL FIELDS
RAILROADS
OIL PIPE LINE
SCALE OF MILES
0 20 40 60 80 100


Oil in Western Canada
PETER POND LAKE
CHURCHILL RIVER
LAC LA ROUGE
STURGEON R.
SASKATCHEWAN RIVER
PRINCE ALBERT
SASKATOON
SASKATCHEWAN
MANITOBA
LAKE
WINNIPEG
LAKE WINNIPEGOSIS
OIL
LINE
REGINA
MOOSE JAW
TO
SWIFT CURRENT
GREAT LAKES
VIRDEN
DAHINDA
MANITOBA
NORTH DAKOTA
SASKATCHEWAN
NORTH DAKOTA
SASKATCHEWAN
MONTANA
MONTANA
N. DAKOTA
"NICKLE MAP SERVICE" CALGARY

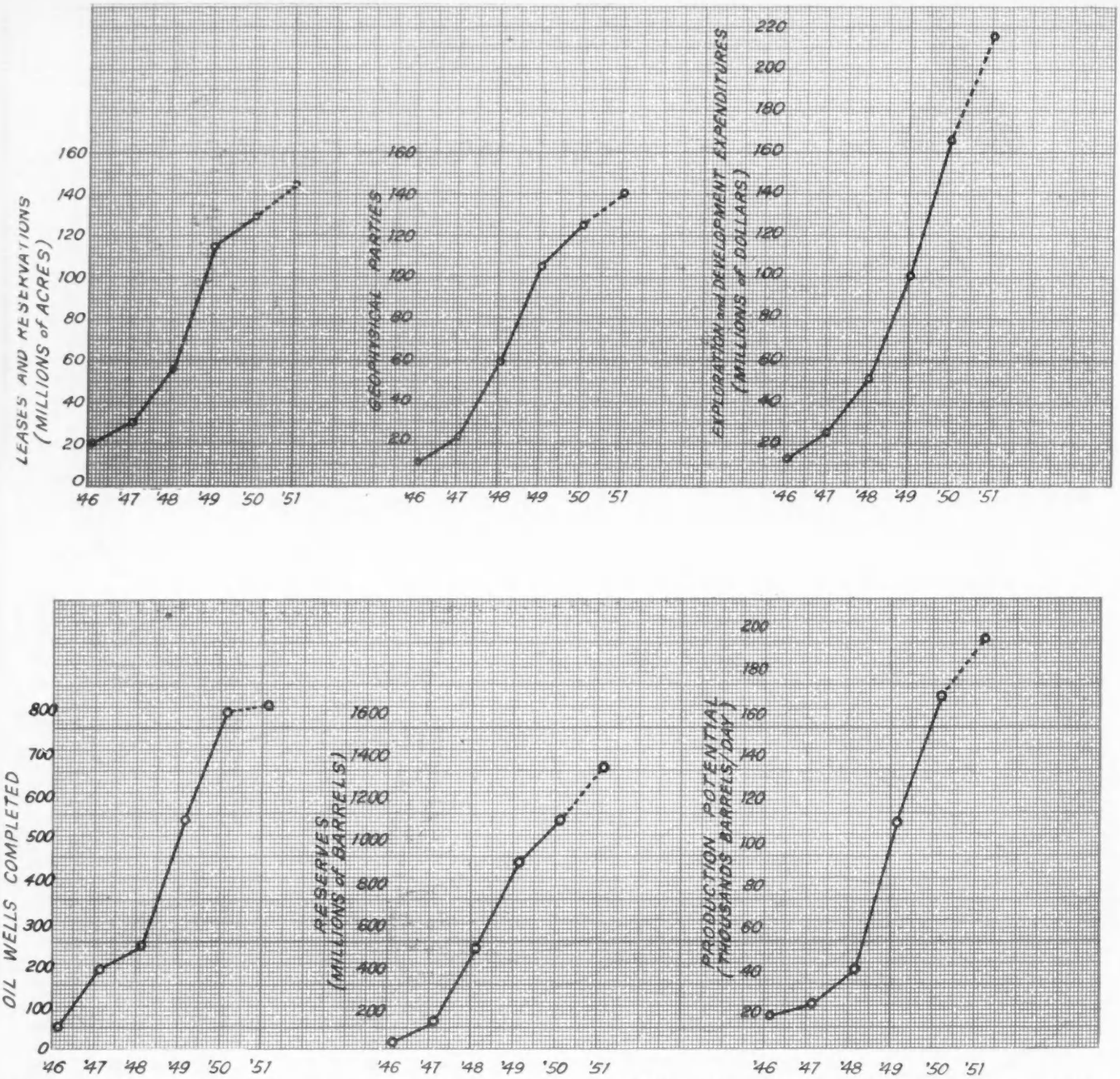

LEASES AND RESERVATIONS (MILLIONS of ACRES)
GEOPHYSICAL PARTIES
EXPLORATION and DEVELOPMENT EXPENDITURES (MILLIONS of DOLLARS)
OIL WELLS COMPLETED
RESERVES (MILLIONS of BARRELS)
PRODUCTION POTENTIAL (THOUSANDS BARRELS/DAY)
'46 '47 '48 '49 '50 '51

FIGURE 1. Canadian prairie oil development progress from 1946 down to present, including estimated figures for 1951. (Curves constructed from data given in "Canadian Oil—1951," an address presented by John R. White, executive vice-president, Imperial Oil Limited, before National Petroleum Association, Atlantic City, September 13, 1951.)

and extending from the Norman Wells Devonian reef field in Northwest Territories down to the Princess area southeast of Calgary and probably continuing down across the southwest corner of Saskatchewan. Only a comparatively small amount of the fairway area has been explored, but already a string of new discoveries, most of them still in early stages of development, has appeared along the length of the trend. Most of the fields still are too new for proper evaluation, but on the strength of high potentials or better-than-average thickness of the reef pays uncovered there would appear to be reason for high optimism regarding the outlook for these potentially large new reserves.

Briefly noted, here are a few of the highlights of activity during 1951:

At the rate new oil and gas discoveries are being made, it appeared that total discoveries for the year might exceed by about one-third the 69 discoveries recorded in 1950 for Western Canada provinces. At one time, during September and October, an oil discovery was recorded every week for at least six consecutive weeks. Gas discoveries were being made at an even higher rate.

Oil wells capable of producing, in August, stood at 2494, a gain of 768 over August, 1950. In August, crude was being produced at a rate of more than 165,000 barrels per day, compared with the approximately 76,000 barrels daily in the like period of 1950. Drilling activity, with a record 206 rigs in operation in the western provinces, was up sharply, with over 537,000 feet drilled in August compared to approximately 400,000 feet drilled in August of last year. Crude reserves, which were an estimated 1.1 to 1.2 billion barrels in 1950, may climb almost to the 1.4 billion mark by the end of this year. Gas reserves also were climbing at an accelerated

rate. Land acquisition, number of field geophysical parties, and expenditures being made for exploration and development, also were climbing to new highs during 1951.

Most of the year's more important oil discoveries, as an inspection of the accompanying table on Canadian oil fields will show, came in during the last six months. Principal facts about each are indicated in columnar form in the table. It still is too early, in most cases, to tell whether any of these discoveries will develop into fields of major size, but on the strength of potentials demonstrated and thicknesses of pay sections uncovered, some undoubtedly will prove of considerable importance.

Wizard Lake, Spectacular Strike

One 1951 discovery was of outstanding importance. In addition to proving the existence of a reef pay of sizeable proportions, it pointed up the surprises and possibilities inherent in the developing of reef structures. In the Wizard Lake area five miles southwest of the southern end of the Leduc field, the team of Texaco Exploration-McColl-Frontenac brought in an important trizone discovery well. Light oil in commercial volume was found in the Basal Cretaceous, light oil was found in a thick D-2 reef zone, and 37.6-gravity oil was found in the D-3. In addition, natural gas was found in the shallow Viking sand.

Developing the discovery, operators carried their fourth well down to make a real test of the thickness of the D-3. Only then was the full extent of the discovery revealed, for about 610 feet of oil-saturated reef pay was cored before the water table was encountered.

This great thickness exceeded even that of the famed Golden Spike reef 20 miles north and a few miles west of the Woodbend sector of the Leduc field. Thick as the Wizard Lake reef is, however, field development probably will proceed at a cautious rate, since the reef might be the pinnacle type with the characteristically rapid buildup and falloff on the sides found in the Golden Spike field.

Viking sand and Basal Cretaceous sands have been showing for production in several areas. Important among these is the new Armena discovery, brought in during September. It is between the still-expanding Joseph Lake Viking sand field on the north and the Camrose Viking sand field on the south. Completions indicate Armena may develop into a major discovery. High potentials of about 400 to 500 barrels per day, high-gravity oil, little gas, and relatively easy drilling make this shallow (3260-foot) sand an attractive objective.

No less interesting are oil discoveries on the extreme ends of this vast northwest-southeast trending province of Alberta. Lending weight to the growing belief that the Williston-Moose Jaw Basin on either side of the international border is one of the most promising new areas of the continent is the Virden discovery made in January, 1951, by Standard Oil Company of California. The well, 50 miles west of Brandon in southwest Manitoba, while of relatively small size, produces 33-gravity oil from Mississippi limestone at a depth of about 2330 feet.

At the far northern end of the trend, a more recent discovery of major significance has been made. Early in November it was reported that Pacific Petroleums, Ltd., in its Peace River-Allied-Fort St. John 1 wildcat, about 45 miles north of Dawson Creek in eastern British Columbia, had found light gravity (33 degrees) green oil in a Permo-Pennsylvanian dolomite section at 5633-55 feet. Casing was being run so a production test could be made. This is the first significant find of light gravity crude found in British Columbia and undoubtedly will touch off a flurry of exploration activity in that sector. This northeastern British Columbia area already has a number of capped gas wells awaiting a market. It is from this Peace River-British Columbia area that many believe the first gas will be exported to the Pacific Northwest by at least one of the several gas transmission companies now awaiting a reply to a pipe line construction application.

Heavy Oil Activity Increasing

Heavy oil areas of eastern Alberta and Saskatchewan are drawing their greatest attention. Increased demand for asphalt for highway construction, railroad fuel and numerous asphalt products needed for the country's rapidly expanding economy have brought about a renewed interest in

Principal Western Canada Oil Fields, 1951

Tabulated list of principal western Canada oil fields, listed in the order of their discovery dates To obtain productive acreage of fields, multiply number of wells by 40 acres, the pattern followed in all but heavy oil fields. Heavy oil areas usually are drilled on 10- or 20-acre spacing patterns. In numerous fields, pay thickness given (particularly D2 and D3 zones) represents only the penetration into the particular zone.

FIELD	Province	Location	Discovery Year	Average Depth	Reservoir Formation	Age of Producing Horizon	Pay Zone Average Thickness	Gravity Degrees API	Oil Production During August, 1951	Number Wells		Rigs Drilling (Oct., 1951)	Remarks
										Producing	Producible		
Turner Valley	Alta.	40 mi. SW Calgary	1914	2500	Sandstone	Cretaceous	15	35–59	235,756	265	329	1	Field is principal supplier of gas to Calgary.
			1924	4000–6000	Dolomite	Mississippian	106						
			1936	6000–9600		Mississippian	70						
Norman Wells	NWT	850 mi. NW Edmonton	1920	1500	Limestone Reef	Devonian	425	38	15,000±		61	..	Northernmost Devonian reef field.
Princess Brooks	Alta.	140 mi. SE Calgary	1939	3250	Sandstone	Cretaceous	12	25–33	12,743	11	17	..	.....
			1942	3310	Limestone	Mississippian	12						
			1944	3975	Dolomite	Devonian	32						
Lloydminster	Alta. & Sask.	Vic. of Lloydminster	1939	1900	Sandstone	Cretaceous	20	9–18	195,000±	325 approx.	..	10	Activity increasing in this two-province area.
Taber	Alta.	35 mi. E Lethbridge	1942	3000–3200	Sandstone	Cretaceous	35	18–23	16,837	18	21	..	.....
Conrad	Alta.	45 mi. SE Lethbridge	1944	3100	Sandstone	Jurassic	10	26	12,241	15	17	..	.....
Jumping Pound	Alta.	20 mi. W Calgary	1944	10000	Limestone	Madison	120	50–55	4,242	3	4	2	Gas-distillate field.
Leduc-Woodbend	Alta.	20 mi. SW Edmonton	1947	5000 (D 2)	Dolomite	Devonian	30	39–41	462,052	290	307	..	Productive limits still being extended.
			1947	5300 (D 3)	Limestone Reef	Devonian	38		902,454	383	390	38	
			1950	4195	Sandstone	L. Cretaceous	?		33,822	17	19		
Redwater	Alta.	30 mi. NE Edmonton	1948	3200 (D 3)	Limestone Reef	Devonian	200	34–36	2,856,051	869	883	4	Limits of field fairly well defined.
Pincher Creek	Alta.	50 mi. SW Lethbridge	1948	12000	Limestone	Madison	400	Dist.	7,344	1	2	1	Gas-distillate producing structure.

TABLE CONTINUED ON NEXT PAGE

Principal Western Canada Oil Fields, 1951—(Continued)

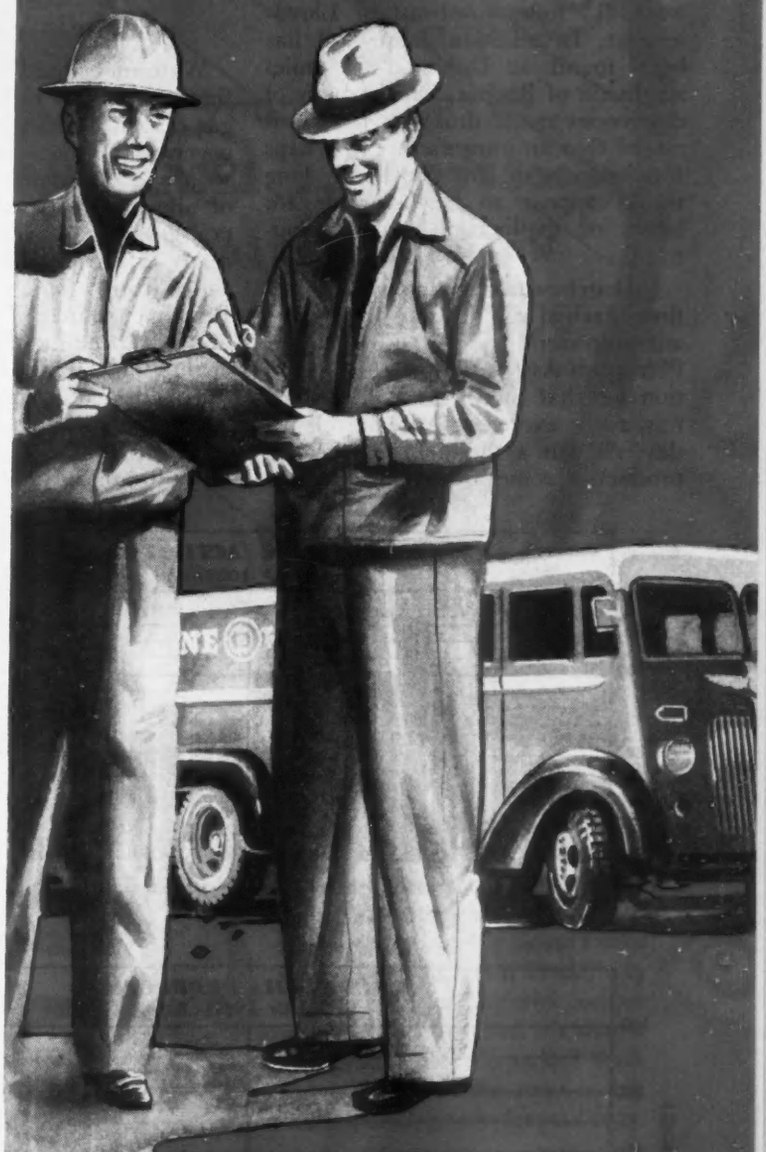
Tabulated list of principal Western Canada oil fields, listed in the order of their discovery dates. To obtain productive acreage of fields, multiply number of wells by 40 acres, the pattern followed in all but heavy oil fields. Heavy oil areas usually are drilled on 10- or 20-acre spacing patterns. In numerous fields, pay thickness given (particularly D2 and D3 zones) represents only the penetration into the particular zone.

FIELD	Province	Location	Discovery Year	Average Depth	Reservoir Formation	Age of Producing Horizon	Pay Zone Average Thickness	Gravity Degrees API	Oil Production During August, 1951	Number Wells: Producing	Number Wells: Producible	Rigs Drilling (Oct., 1951)	Remarks
Stettler	Alta.	93 mi. SE Edmonton	1949	4100	Sandstone	L. Cretaceous		28	4,855	3	3		
				5100 (D2)	Dolomite	Devonian	50	31	29,603	23	24	5	
				5400 (D3)	Limestone Reef	Devonian	50	31	11,801	9	9	..	
Normandville	Alta.	220 mi. NW Edmonton	1949	6700	Limestone Reef	Devonian	30	39	1,773	1	1	..	Productive limits not yet defined.
Barrhead	Alta.	55 mi. NW Edmonton	1949	4000	Limestone	Madison	130	22–24	.....	...	2	..	Two-well find; not producing at present time.
Bon Accord	Alta.	23 mi. N Edmonton	1949	3600 (D2)	Dolomite	Devonian	40	34	841	1	1	..	D3 zone water bearing.
Golden Spike	Alta.	16 mi. W Edmonton	1949	(D2)	Dolomite	Devonian		34–38	2,408	1	1	..	D3 zone thickness in excess of 540 feet.
			1949	5950 (D3)	Limestone Reef	Devonian	540	.....	103,463	8	8	..	Is second only to Wizard Lake in pay thickness.
			1951	4630	Sandstone	L. Cretaceous		35	.....	...	1	..	
Excelsior	Alta.	18 mi. N Edmonton	1949	3840 (D2)	Dolomite	Devonian	40	36–37	90,990	29	30	..	
Campbell	Alta.	8 mi. NW Edmonton	1949	3700	Sandstone	L. Cretaceous	30	31–35	5,879	9	13	2	D2 & D3 zones not protive.
Whitemud	Alta.	10 mi. SW Edmonton	1949	4000	Sandstone	L. Cretaceous	..	35–39	1,846	3	4	..	
Joseph Lake	Alta.	20 mi. SE Edmonton	1949	3300	Sandstone	Viking Sand (Cret.)	15	38	71,924	58	60	1	Productive limits not yet entirely defined.
Acheson-Stony Plain	Alta.	8 mi. W Edmonton	1950	4320 (D2)	Sandstone	L. Cretaceous			1,717	4	4		
				5000	Limestone Reef	Devonian	120	36	110,276	23	24	12	Productive limits not yet defined.
Big Valley	Alta.	85 mi. NE Calgary	1950	(D2)	Dolomite	Devonian	60	33	10,692	8	9	6	Productive limits undefined.
				5400 (D3)	Limestone Reef	Devonian	30		4,331	3	3		
Whitelaw	Alta.	260 mi. NW Edmonton	1950	3815	Sandstone	Permo-Penn	250	28	.....	...	1	1	New producing zone I.P. 640 B/D.
Duhamel	Alta.	50 mi. SE Edmonton	1950	4500 (D2)	Dolomite	Devonian	33	34	24,776	4	4	..	
				4800 (D3)	Limestone Reef	Devonian	30			7	7		
Hearts Hill	Sask.	85 mi. SE Lloydminster	1950	2685	Sandstone	L. Cretaceous	10	14	.....	1	1	1	Significant step-out for heavy oil area.
Spring Coulee	Alta.	30 mi. SW Lethbridge	1950	6000	Limestone	Madison		36–39	930	4	4	1	
Camrose	Alta.	42 mi. SE Edmonton	Jan. '51	3235	Sandstone	Viking Sand (Cret.)	7	38	6,254	4	6	1	
Drumheller	Alta.	65 mi. NE Calgary	1950	4450	Sandstone	L. Cretaceous	40	32	1,133	2	4	2	I. P. Cret. 195-200 B/D; I. P. Dev., 1000 B/D.
			July '51	5420 (D2)	Dolomite	Devonian	30	30	632	1	1	..	
Virden	Man.	50 mi. W Brandon	Jan. '51	2330	Limestone	Mississippian		33	.....	...	4	3	Significant disc. on Canadian side Williston Basin.
Ellerslie	Alta.	4 mi. S Edmonton	April '51		Sandstone	Viking Sand (Cret.)			.....	...	1	2	Productive limits as yet unknown.
				4000	Sandstone	L. Cretaceous	28	28	4,834	5	6	..	
Majeau Lake	Alta.	50 mi. NW Edmonton	May '51	4250	Limestone	Mississippian	85	60	.....	...	1	1	Wet gas discovery; I. P. gas 9½ mill; Dist. 24 B/D
Wizard Lake	Alta.	35 mi. SW Edmonton	April '51	4870	Sandstone	L. Cretaceous	35		.....	...	...	..	
			May '51	5695 (D2)	Dolomite	Devonian	30		.....	...	...	..	
			May '51	6300 (D3)	Limestone Reef	Devonian	610	38	8,687	3	2	4	Greatest thickness D3 reef pay so far discovered.
Didsbury	Alta.	30 mi. N Calgary	May '51	8180	Limestone	Madison	30	50	.....	...	1	..	Still testing discovery well.
Alliance	Alta.	130 mi. NE Calgary	June '51	3150	Sandstone	L. Cretaceous	15	26	1,149	1	1	1	
Cessford	Alta.	100 mi. E Calgary	June '51	3280	Sandstone	L. Cretaceous		26	.....	...	1	2	I.P. 190 B/D on swab test.
Pine Lake	Alta.	67mi.NECalgary	July '51	7050 (D2)	Dolomite	Devonian			.....	...	1	1	Still testing as of mid-Oct.
Glenevis	Alta.	37 mi. NW Edmonton	July '51	4330	Limestone	Mississippian	25	18	.....	...	1	..	Heavy oil I.P. 96 B/D.
Belloy	Alta.	235 mi. NW Edmonton	July '51	4110	Sandstone	Permo-Penn	8	28	.....	...	1	1	Very thin pay zone.
Bashaw	Alta.	70 mi. SE Edmonton	July '51	5810 (D3)	Limestone Reef	Devonian	19	39	2,300	2	2	4	I.P. on 8-hr. pot. from 19' penetration was 1300 B/D rate.
Neapolis (Olds)	Alta.	35 mi. N Calgary	July '51	8110 (D3)	Limestone Reef	Devonian	20	58	.....	...	1	1	Wet gas discovery. I.P. Dist. 700 B/D; Gas 60 mill. cu. ft.
New Norway	Alta.	50 mi. SE Edmonton	Aug. '51	4660 (D2)	Dolomite	Devonian	100	38	.....	...	...	..	
				4870 (D3)	Limestone Reef	Devonian	60	..	.....	...	1	3	
Coleville	Sask.	15 mi. NW Kindersley	Aug. '51	2720	Sandstone	L. Cretaceous	60	14	.....	...	1	3	Disc. originally a dev. test; Gas in Viking sand.
Armena	Alta.	30 mi. SE Edmonton	Sept. '51	3260	Sandstone	Viking Sand (Cret.)	20	37	.....	...	2	2	Moving in service rig to put on production.
Caprona	Alta.	90mi.NECalgary	Sept. '51	5300 (D2)	Dolomite	Devonian	80	30	.....	...	1	1	
So. Calmar	Alta.	25 mi. SW Edmonton	Sept. '51	6190 (D3)	Limestone Reef	Devonian	15	40	.....	...	1	2	I.P. of disc. 1760 B/D.
Clive	Alta.	95mi.NECalgary	Sept. '51	6200 (D2)	Dolomite	Devonian	12	39	.....	...	1	1	Still testing disc. well.
Dahinda	Sask.	55 mi. SW Regina	Sept. '51	4695	Dolomite	Mississippian	10	20	.....	...	1	1	Disc. well being deepened.

Experience proves it!

when you call Lane-Wells, you get the job done RIGHT!

Many hundreds of successful operators can testify that when the Lane-Wells truck rolls up to the rig, you have everything right there to do your perforating *right!* Up-to-the-minute equipment, engineered to fit the needs of *your* job . . . accurate depth measuring devices to put the shots exactly where you order them — and an operating crew that knows your well conditions, your problems. That thoroughly trained Lane-Wells crew plays a big part in a good perforating job. Carefully chosen men, well trained and thoroughly experienced, they get on the job quickly, rig up fast and complete the job in the shortest time consistent with accuracy and safety. That experienced team work saves unnecessary down time. Call Lane-Wells on your next perforating job; when the truck rolls away afterwards, you'll agree that experience gets the job done RIGHT!



Tomorrow's Tools -Today!

LANE WELLS

Better Perforating

General Offices, Export Office and Plant • 5610 So. Soto St. Los Angeles 58, California

Los Angeles • Houston • Oklahoma City
Lane-Wells Canadian Co. in Canada
Petro-Tech Service Co. in Venezuela

AG-411

heavy oil. Ten rigs are currently operating in the relatively shallow (1900 feet) Lloydminster area straddling the Alberta-Saskatchewan border. Seventy-one producing wells have been completed so far this year. With 50 to 60 more scheduled before year-end, about 130 new producers will have been added to the record by the end of 1951.

New heavy oil fields are coming to light both to the north and to the south of the Lloydminster area. During 1951, heavy oil was discovered at Bonnyville, Alberta, about 75 miles northwest of Lloydminster, and at Coleville, near Kindersley, Saskatchewan, 115 miles southeast of Lloydminster. In addition, heavy oil has been found at Dahinda, 55 miles southwest of Regina. On the basis of discoveries made thus far, it is estimated that an immense area perhaps 100 miles wide by 200 miles long would appear to be favorable for heavy oil exploration and development.

Saskatchewan's September production reached an all-time high. This announcement by the Lloydminster Petroleum Association places production for that month at 124,154 barrels, a rate exceeding 4100 barrels per day. All but a slight portion of this production comes from the more than 190 producing wells in the heavy oil fields in the general Lloydminster area in the western part of the province. Production this year in Saskatchewan is expected to reach a new high of more than 1,200,000 barrels.

In another area capable of producing heavy oil, the much-discussed Athabaska tar sands drew renewed interest. To stimulate activity in the vast deposits situated 250 miles northeast of Edmonton, the Provincial Government held a five-day technical symposium at Edmonton early in September. Plans to encourage Athabaska acreage play and pilot plant development were unfolded.

Gas Reserves Mount

Western Canada gas reserves continue to show a rapid increase. With gas discoveries outnumbering oil discoveries, the concensus is that Alberta soon will act favorably on the matter of allowing exportation of gas. Several gas reserves appraisals have been made in the province, and estimates range from 5 to 12 trillion cubic feet. Principal source of the discrepancy appears to be in the method used in evaluating the numerous one-well gas discoveries and drill-stem tests of zones that have not yet been fully tested as to their ability to produce or as to areal extent of the structure. The Alberta government, still deliberating on the problem, has said approximately 4½ trillion cubic feet of gas reserves should be set aside to assure its having 3 trillion cubic feet deliverable over the next 30 years for its domestic commercial and industrial uses.

Development is continuing at Pincher Creek, largest single known gas reserve in Alberta. Current estimates place gas reserves in this gas and distillate field in southern Alberta at about 1¼ trillion feet.

In the Peace River area more than a dozen gas discoveries have been made this year. One of the gassers, 45 miles east of the British Columbia boundary and southwest of Whitelaw, recently established an exceptionally high potential of more than 60 million cubic feet a day. In the North Tangent area 25 miles southeast of Whitelaw, one of a pair of stepout wells found a heavy flow of gas not only in Triassic dolomite but also in an underlying sand formation encountered at 2900 feet.

Rigs at All-Time High

In mid-October there were 206 drilling rigs active in four provinces of Western Canada, representing an all-time high and exceeding the previous month's record-breaking level of 201 rigs. Wildcatting accounted for 102 of these rigs. The remaining 104 were on development work. Some idea of the rapid increase in activity can be gained by comparing these figures with those of the comparable period a year ago when there were 134 rigs active, 51 wildcat and 83 development rigs.

Most drilling activity is in Alberta, where 77 of the rigs are active on wildcats and 100 on development. Saskatchewan has 18 rigs working on wildcats and three on field wells. Manitoba has three wildcat rigs operating and one working in a proven area. British Columbia has four active rigs on wildcat locations.

Footage, Production Increase

Figure 2 shows the trend of Alberta drilling activity. During August of this year, 537,374 feet were drilled, an appreciable increase over the 403,604 feet drilled in August, 1950. Licenses issued in August to drill new wells amounted to 124, as compared to the 116 issued during the corresponding period last year. Cumulative applications for the year numbered 832 by September 1 as compared with 706 at the same time last year.

Alberta crude production likewise has exhibited a remarkable rise. The trend of production since January, 1950, (Figure 3) clearly shows the

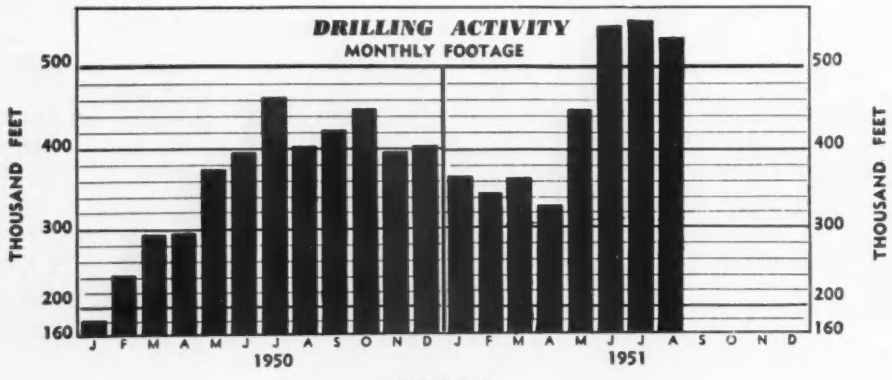


FIGURE 2.

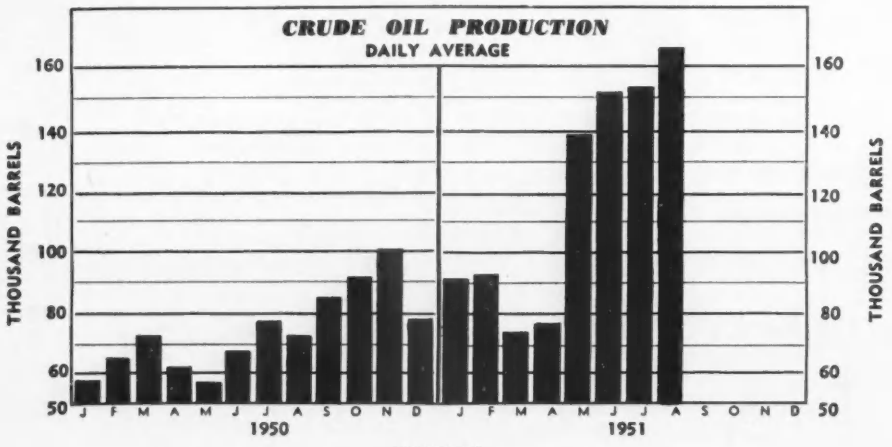


FIGURE 3.

Charts from Petroleum and Natural Gas Conservation Board, Calgary, Alberta.

It's easy to run a Totco; there isn't another recording instrument made that handles as easily. Only Totco will give that knife-edge accuracy, every time... try it and you'll agree that the easiest and best way to keep your wells within 2° of vertical is to guide the bit with Totco readings.

It's no great trick to take the directly vertical, short way to producing formations; Totco Recorders can guide the bit straight and true, never getting more than 2° off the vertical... and it doesn't take a specialist to run a Totco; any member of the drilling crew can operate a Totco Recorder, it's simple and fool proof. Totco Controlled Vertical Drilling bulletins tell the story of low cost per foot vertical drilling; write for your copy.

Distributed exclusively, throughout the world of oil except in the U.S.A. and Canada, by

LUCEY

LUCEY EXPORT CORPORATION

233 BROADWAY . . . NEW YORK 7, N. Y.

Broad Street House, London, E.C. 2, England • 413 Sterling Building, Houston, Texas

Calle Defensa 320, Buenos Aires, Argentina • Calgary: 603 8th Avenue West

Edmonton: 8645 Stadium Road • Alberta, Canada

effect on production of the Interprovincial pipe line, which was placed in service in October, 1950, but which was not up to capacity throughout until last spring. August production reached a record high of 5,144,970 barrels, a rate of more than 165,000 barrels per day and more than five times the figure for the comparable 1950 period. It is expected, however, that allowables for winter months will be reduced, reflecting the usual winter drop in market requirements for refined products. Unofficial estimates place Western Canada's actual potential, or ability to produce, at over 200,000 barrels a day.

Proved crude reserves in Western Canada, it is conservatively estimated, are somewhere between 1.3 and 1.5 billion barrels, with all but a small percentage being in Alberta. Even these figures are slated to be revised upward because of potentially significant reef discoveries and some Viking sand finds now in initial development stages.

Exploratory Activity Increasing

Exploratory activity is proceeding at an increasingly rapid rate. In mid-October 152 survey parties were in the field, including 132 seismograph, 18 gravity meter and 2 magnetometer. Alberta, with 104 units, had 90 seismograph and 14 gravity meter crews in the field. Saskatchewan, with 38 units, had 34 seismograph, 3 gravity meter parties, and 1 magnetometer unit. Manitoba had 7 units, including 5 seismograph, 1 gravity meter, and 1 magnetometer. British Columbia counted three seismograph parties. The total figure for Western Canada represents an increase of more than 20 percent above the number of field parties at the same time last year.

Pipe Line, Refinery Expansions

Pipe line activity is increasing at a pace designed to keep abreast of the growing output of the fields. Interprovincial Pipe Line is about to be expanded with the addition of five new pump stations and more storage facilities at Superior and Sarnia. Currently handling about 100,000 barrels daily, the expanded facilities will give the line an expected capacity of around 150,000 barrels daily by spring. Feeder lines are being built to take oil from some of the newer fields. The most recent ones are the six-inch line just being completed which will take Joseph Lake oil to the Interprovincial line in Edmonton (and it is predicted in some quarters that this line ultimately will be extended to include the new Armena field southeast of Joseph Lake) and the eight-inch line being laid to tap the new Wizard Lake discovery, taking that crude to the McColl-Frontenac refinery at Edmonton.

A $100 million refinery expansion and construction program, more than half finished, is expected to be completed by the end of next year. Included in the program is the enlarging of refineries at Saskatoon, Moose Jaw, Regina, Sarnia, and the building of two new refineries at Superior, a new one at Winnipeg and Sarnia, and three new large refineries at Edmonton.

Operators Face Winter Problems

Of considerable importance to both drilling companies and producers is the problem faced every year of maintaining efficient operations through the winters of the prairie provinces. When winter closes roads, freezes lead lines, treater units and similar equipment, lease operations often come to a standstill. During extremely low temperatures, when the mercury drops to 40 or more below zero, steels become brittle, lubricants in both bearings and gear boxes fail to function properly, and control mechanisms fail. Much progress has been made in providing shelters and supplemental heating equipment, but it has been at considerable extra capital cost. With exploration work pushing farther into the northern bush country, problems are likely to increase. Many operators believe assistance and research provided by manufacturers and suppliers could solve many problems at a cost considerably less than under present methods of providing makeshift protection of equipment.

Road building work has been emphasized in the western prairie provinces. Unusually good progress has been made by Alberta in the paving of main highways and improving and grading of many secondary roads. This wise and farsighted program of investing provincial funds in extensive highway improvements most certainly will be reflected in a further speeding-up and expediting of exploration work within the province.

First Major Oil Discovery Made in British Columbia

FIRST major oil discovery in the province of British Columbia was reported November 2 from the Fort St. John region of northeast British Columbia, along the Alaska highway.

Discovery well is Peace River-Allied-Fort St. John 1, about five miles south of the town of Fort St. John. The oil strike came in the Permo-Pennsylvanian limestone formation at a depth of 5633-55 feet.

Recovery in a 90-minute drill-stem test consisted of 900 feet of oil, 120 feet of gassy mud and 480 feet of salt water. Estimates on the gravity of the crude have ranged from 33 to 40 degrees.

Participating in the discovery are Pacific Petroleums, Limited, Canadian Atlantic Oil Company Limited, Hudson's Bay Oil and Gas Company, Union Oil Company of California, Peace River Natural Gas Company, Sunray Oil Corporation, Empire Petroleums Limited, Norman R. Whittall Company, Ltd., and William Innes and associates.

Pacific Petroleums announced the well will be placed on production after electric log has been run. The discovery climaxed an extensive exploration program, aimed primarily at opening up natural gas reserves, carried out this year by the discovery team in the Peace River area of northwest Alberta and northeast British Columbia.

At Victoria, capitol of British Columbia, Dr. T. B. Williams, petroleum and natural gas controller for the province, said "it is a very big announcement. The ultimate possibilities are tremendous."

Oil has been sought in British Columbia for almost 30 years, without commercial success.

ACKNOWLEDGMENT

WORLD OIL gratefully acknowledges the assistance and cooperation of the following for much of the information presented in this special Canadian Issue: The Petroleum & Natural Gas Conservation Board, Calgary, Alberta; *The Daily Oil Bulletin*, Calgary, Alberta; Nickle Map Service, Calgary, Alberta; Petroleum and Natural Gas Division, Canadian Bank of Commerce, Calgary, Alberta; and various oil companies, drilling contractors and service companies who generously assisted in the assembling of data concerning Western Canada operations.

NATURAL GAS IS THE FUEL for this International U-9 engine, running a 64-inch stroke, 22-stroke-per-minute pump. Superintendent Boyd has fifteen International power units in this mountainside oil field. He likes their endurance and reliability, backed up by International service facilities all through the oil fields.

A PIP FOR PUMPING

Rugged International engine found tops in high-producing California oil field

THE Brea Canyon Oil Company pumps a 40-well field on a California mountainside, and gets unusually high production by compressing the casing head gas and feeding it back into the wells to use over and over again.

All the engines but one in the field are Internationals, and—according to Superintendent A. L. Boyd—*"They run 24 hours a day, yet on our monthly checks, usually nothing more than an occasional fan belt replacement is necessary.*

"Maintenance costs are very small, and the service and performance are tops. From our experience, we're more than enthusiastic about International oil field engines."

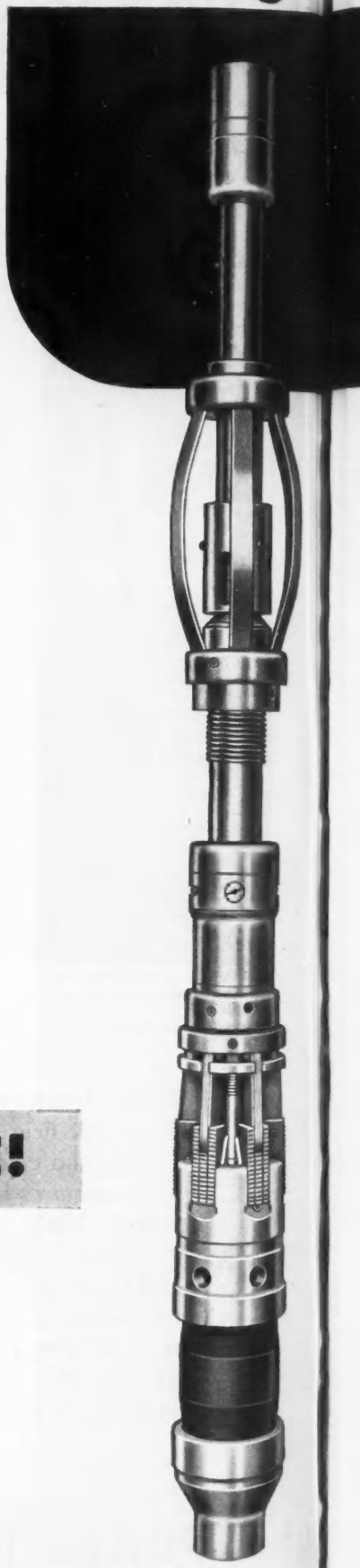
Want more proof? Want more facts? Get the details from your International Industrial Distributor. Find out how International *"Power that Pays"* can pay off for you!

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILL.

POWER THAT PAYS — **INTERNATIONAL**

INTERNATIONAL HARVESTER

For Squeeze Cementing, Testing



Be sure you are using the BEST possible equipment for these important steps in well completion . . .

- *testing casing, or locating holes in pipe;*
- *placing cement, plastic, acid, or any other fluid, at any necessary pressure, behind the casing or liner through perforations, or in open hole below the shoe;*
- *setting in lime formations for acidizing or squeeze cementing;*
- *pressure testing the effectiveness of a previously performed cement job.*

The BAKER RETRIEVABLE CEMENTER (Product No. 411-RT) provides a safe, positive device for performing all of the above vital operations. It is operated mechanically, and is not dependent upon fluid pressure to set or release. It functions successfully in high-pressure wells, and will withstand with safety any pressure that may be imposed upon the well casing. It operates with equal efficiency and safety in low-pressure or low fluid level wells.

IT'S SAFE!

IT'S POSITIVE!

IT'S "RETRIEVABLE"

IT'S MADE BY BAKER OIL TOOLS, INC.
Houston • Los Angeles • New York

Use the efficient BAKER

g Acidizing and Plasticizing

Use the Baker RETRIEVABLE CEMENTER with these outstanding features:

1. *RUNS IN FAST—from 1 to 4 hours time is saved over the time required to run in a cementer equipped with swab cups;*
2. *RUNNING-IN STRING WILL NOT FLOW OVER while a Baker Cementer is being run in the hole at reasonable speed;*
3. *PERMITS CIRCULATING THE LONG WAY;*
4. *FUNCTIONS EFFICIENTLY IN LOW FLUID LEVEL WELLS as well as in high-pressure wells;*
5. *PERMITS TESTING CASING, or protecting casing during a squeeze job, by applying reasonable pressure to the annulus after cementer is set;*
6. *WITHSTANDS ANY PRESSURE below the cementer that is safe for the well equipment;*
7. *CIRCULATION POSSIBLE IF PACKING UNIT STICKS by means of a Circulation Joint above the Cementer;*
8. *RELEASES IN EMERGENCY—Contains safety thread for quick release.*
9. *The new Model "RT-8" may be rotated safely out of the hole, at a real saving in rig time.*

and always remember . . .

You can depend upon the Baker Retrievable Cementer—It's the BEST!

RETRIEVABLE CEMENTER!

IMPORTANT *Canadian* FIELDS

Drilling operations in Western Canada are complicated by the necessity of having to enclose and provide heating for drilling equipment and derrick floor area. This photo of a drilling rig in operation was taken shortly after one of the first 1951 winter snow storms.

Wizard Lake Field is Four-Zone Strike

WIZARD Lake proved the most outstanding, if not the most spectacular, Alberta discovery of the year. Discovered in May by Texaco Exploration Company Ltd.-McColl-Frontenac Oil Company, Ltd., the field is about 35 miles southwest of Edmonton and five to six miles southwest of the Calmar sector of the Leduc field.

The discovery proved the existence of natural gas in the shallow Viking sand, light oil in commercial volume in the Basal Cretaceous, oil in a thick D-2 Devonian reef zone, and 37.6-gravity oil in the D-3 zone.

Two more wells subsequently were completed and placed on production by the same operator, but the fourth venture was carried on down to test the thickness of the D-3. This well gave the first indication of the size of the pool when it proved 603 feet of D-3 pay, a thickness that even surpassed that of the former record-breaking Golden Spike reef field.

With four wells completed, four more drilling and additional locations staked, it is apparent the field will be developed rapidly. Rapid development of the Wizard Lake field, which has all the earmarks of a reserve of major importance, has focused attention on the five-mile strip between it and the Calmar sector to the northeast. The Texaco Exploration-McColl-Frontenac team controls most of the acreage in the immediate vicinity of the present productive area. A late report indicated the company's Wizard Lake B-4, ⅜-mile northeast of the D-3 producer, found natural gas in the Lower Cretaceous.

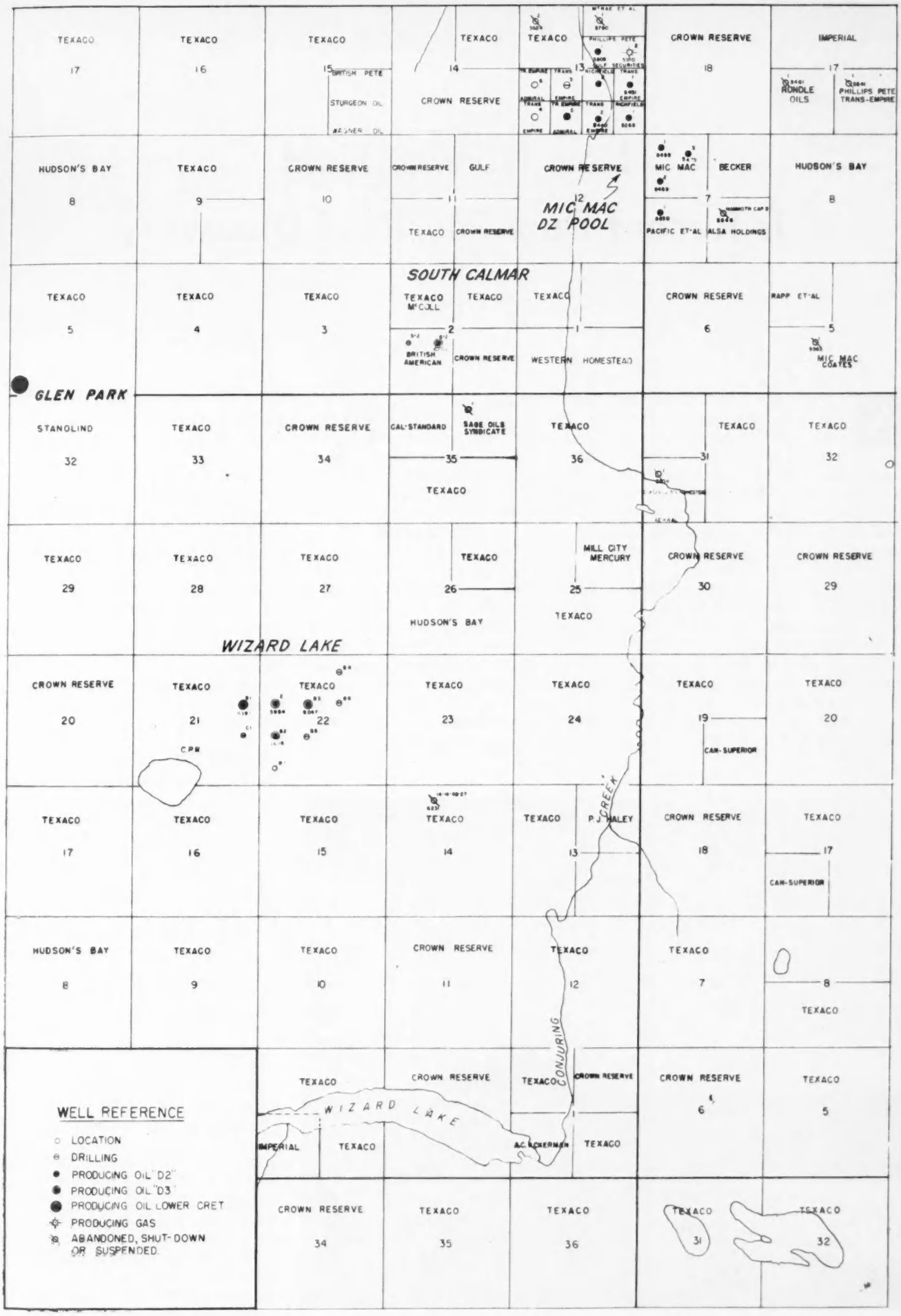
PRODUCTION DATA: With spacing at 40-acre intervals, about 160 acres have been drilled up, and on the basis of present data it is estimated that at least another 300 acres are proved up. It is recognized, however, that, like Golden Spike, this new field may be proven to be a typical pinnacle-type reef with characteristically rapid buildup and equally fast falloff on the other side.

Wells are completed barefoot. Surface string of 10¾-inch pipe generally is set at about 640 feet and cemented to the surface. Seven-inch oil string is set at the top of the D-3 and cemented with about 550 sacks, an amount designed to carry the cement column to a point above the Viking sand. The formation is not acidized. Wells are completed flowing. October market allowable was 493 barrels per day per well. Casing pressures vary but are in the order of 1700 pounds per square inch, and tubing pressures of from 500 to 700 pounds. The 37.6-gravity crude is sweet. Crude has been trucked, but an eight-inch pipe line now under construction shortly will deliver crude to the new McColl-Frontenac refinery at Edmonton.

DRILLING DATA: Jackknife-type rigs are used in drilling the 6000-6600 foot wells. Typical drilling program calls for drilling nine-inch, later reamed to 12¾-inch surface hole to 650 feet, then nine-inch hole to the top of the D-3. The pay interval usually is diamond cored, the 6⅛-inch bit drilling the final OD of the hole through the pay. Typical drill string used is 4½-inch drill pipe with several 30-foot 6¼-inch drill collars. Formations drilled are mostly thick sections of Cretaceous shales and sands down to the top of the Devonian section. Some trouble is experienced with a caving shale condition in certain of the Cretaceous beds, requiring a close watch on mud water loss properties. Mud of about ten-pound weight generally is carried. Danger of blowouts is not great, but mud weight must be watched from the Viking sand on down. Some lost circulation problems are experienced, particularly in the porous D-3 reef pay section.

Drilling, for the greater part of the hole, is not considered hard. Some lost circulation in cementing is experienced if too high a column is carried. The column generally is carried to just above the Viking sand. Typical rotary speeds vary from about 130 revolutions per minute in the upper part to around 250 in the lower part of the hole. Weight on the bit varies from 20,000 to 25,000 pounds. Only one fishing job, caused by shales bridging in the hole, has been experienced thus far.

Average rigging-up time is about two days. Drilling time, from spudding-in to completion, varies according to depths and coring done, but averages about 45 days. Rigs are diesel powered and two mud pumps, one for circulating and one for mixing and standby, are used. Two blowout preventers are installed. Mud ditches generally are excavated. Water is obtained from a nearby lake. Supply and machine shop facilities are located at Edmonton. Crews generally live in nearby towns. Off-highway roads are graded gravel and dirt, with some of them having muskeg in spots. Prevailing footage rates are around $7 per foot, with day rates varying from $700 to $800.



WIZARD LAKE FIELD AREA

IMPORTANT Canadian FIELDS

New Norway Field Is Recent Dual Pay Reef Discovery

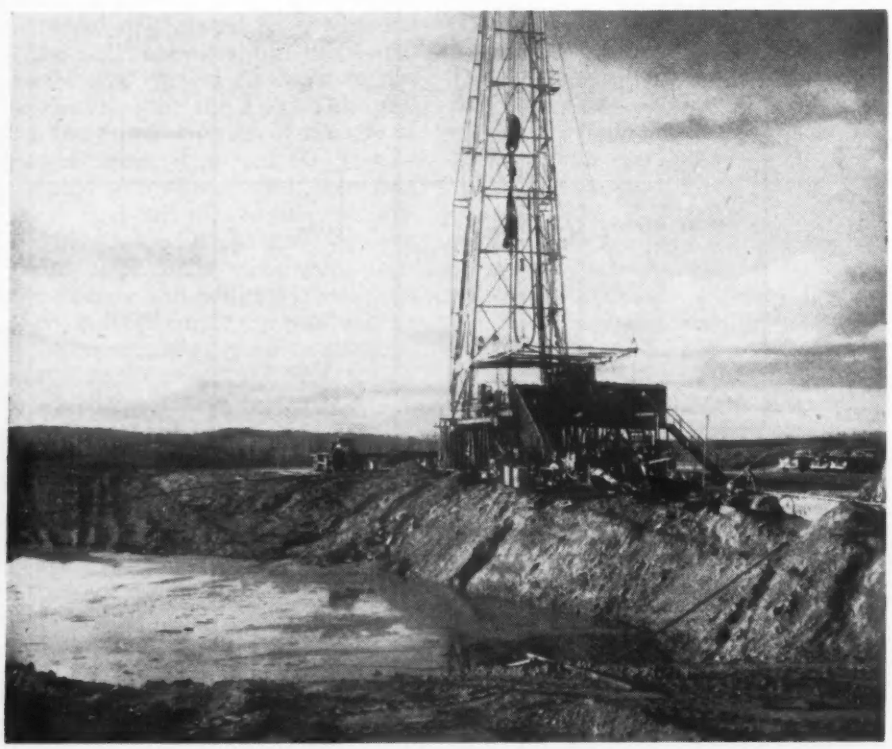
AMONG the more promising reef discoveries of the year was New Norway, a dual pay Devonian reef strike approximately three miles southeast of the Duhamel field and separated from the field by a dry hole. The area is approximately 53 miles southeast of Edmonton. Canadian Superior of California, Ltd's, Holt 15-36, the discovery, opened 100 feet of D-2 and about 62 feet of D-3 zone pay. The well was placed on production in the D-3 zone for an initial production of about 230 barrels per day of 38-gravity crude, but no official allowable was immediately determined and flow tests with various size chokes were being conducted. The D-2 in the discovery well was topped at 4584 feet and the D-3 at 4858 feet. Total depth is 4955 feet.

Operator currently is drilling on the second test at a location slightly over a half-mile southwest of the discovery. In addition, other offset operators, Canadian Gulf Oil Corporation and Sun Oil Company, were drilling at offset locations to the west and north, respectively. Imperial Oil, Ltd. also holds acreage adjoining Superior's lease to the east of the discovery. Only continued development of the area will determine extent of the find, but on the basis of the dual pay already recorded, there is reason to believe this will prove one of the year's more important reef discoveries. It was understood that the Gulf well, west offset to the discovery, was running slightly higher than did the initial well.

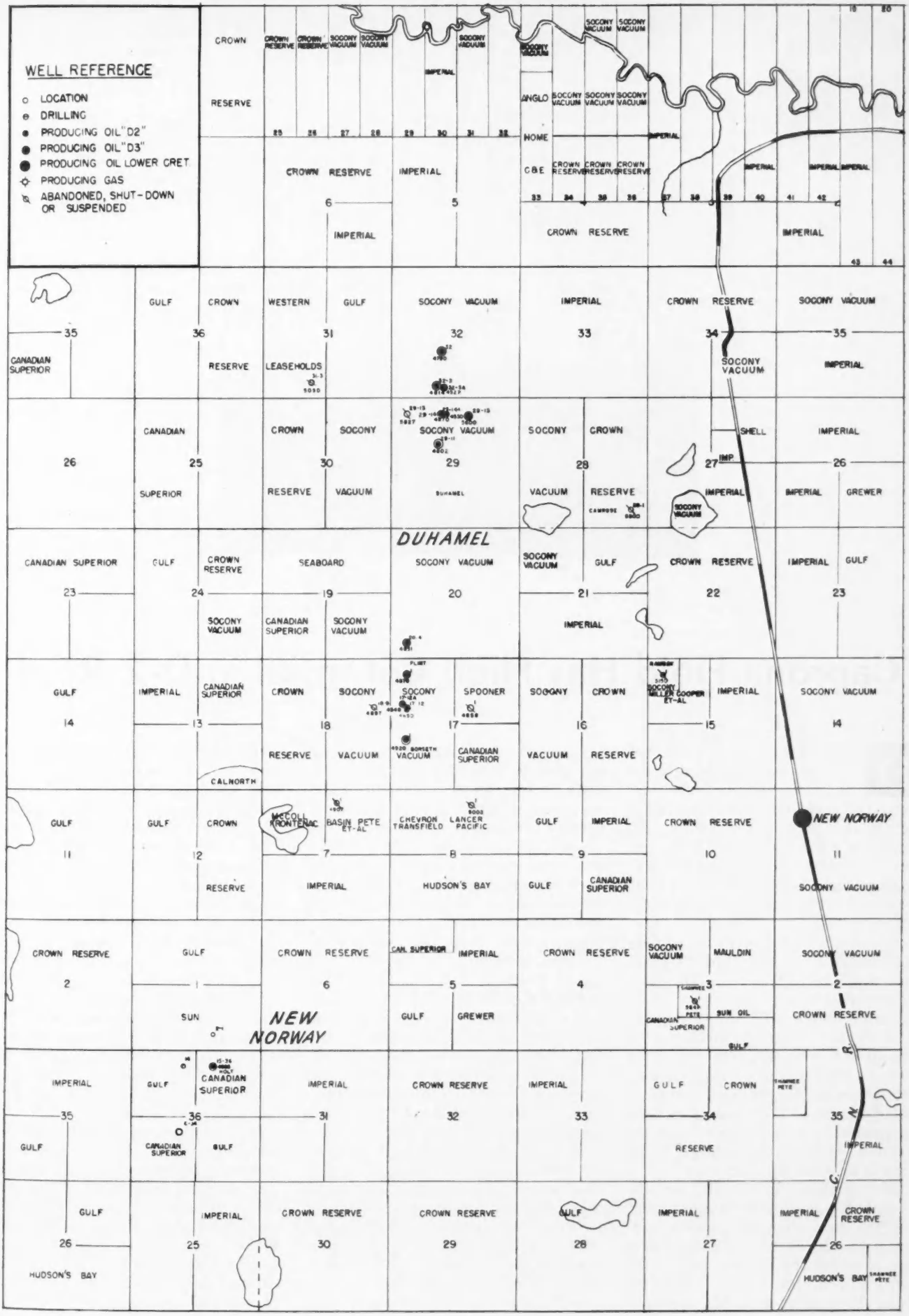
PRODUCTION DATA: The completion program in the initial well included setting 10¾-inch surface casing at 600 feet and running seven-inch oil string to total depth, through both the D-2 and D-3 zones. The lower D-3 zone then was gun- and jet-perforated and the opened interval given a 250-gallon acid treatment. The well flowed 38-gravity, sweet crude. Crude is now being trucked to Socony-Vacuum Oil Company's Duhamel siding. Spacing is on a 40-acre pattern.

DRILLING DATA: Medium size jackknife rigs, diesel powered, generally are used in the area. A typical drill pipe program includes 3½-inch drill pipe with three 30-foot 6¼-inch drill collars. Drilling is not considered difficult and mud control is not critical except when drilling in the reef pay zone. One mud pump usually is used. As in other areas, some lost circulation is experienced in the reef zones and mud weight must be kept down to avoid lost circulation. When the oil string is cemented, sufficient cement is used to cover the Viking sand and the Lower Cretaceous section.

Rigging-up time averages two to three days and drilling time, from spudding-in to completion, averages about seven weeks. Mud ditches usually are excavated. Drilling water supply is obtained from nearby ponds or lakes. Principal supply center is Edmonton. Off-highway roads in the area are graded gravel and dirt. Prevailing footage rates in the area vary with the season and range from $6 to $8 down to the coring point. Day rates vary from $750 without drill pipe to $850 with drill pipe.



A drilling rig penetrates ever closer to prolific Canadian reef horizon.



NEW NORWAY FIELD AREA

IMPORTANT *Canadian* FIELDS

Rigging-up work nears completion on this diesel-powered jackknife rig.

Caprona Field Has High Potential in D-2 Reef

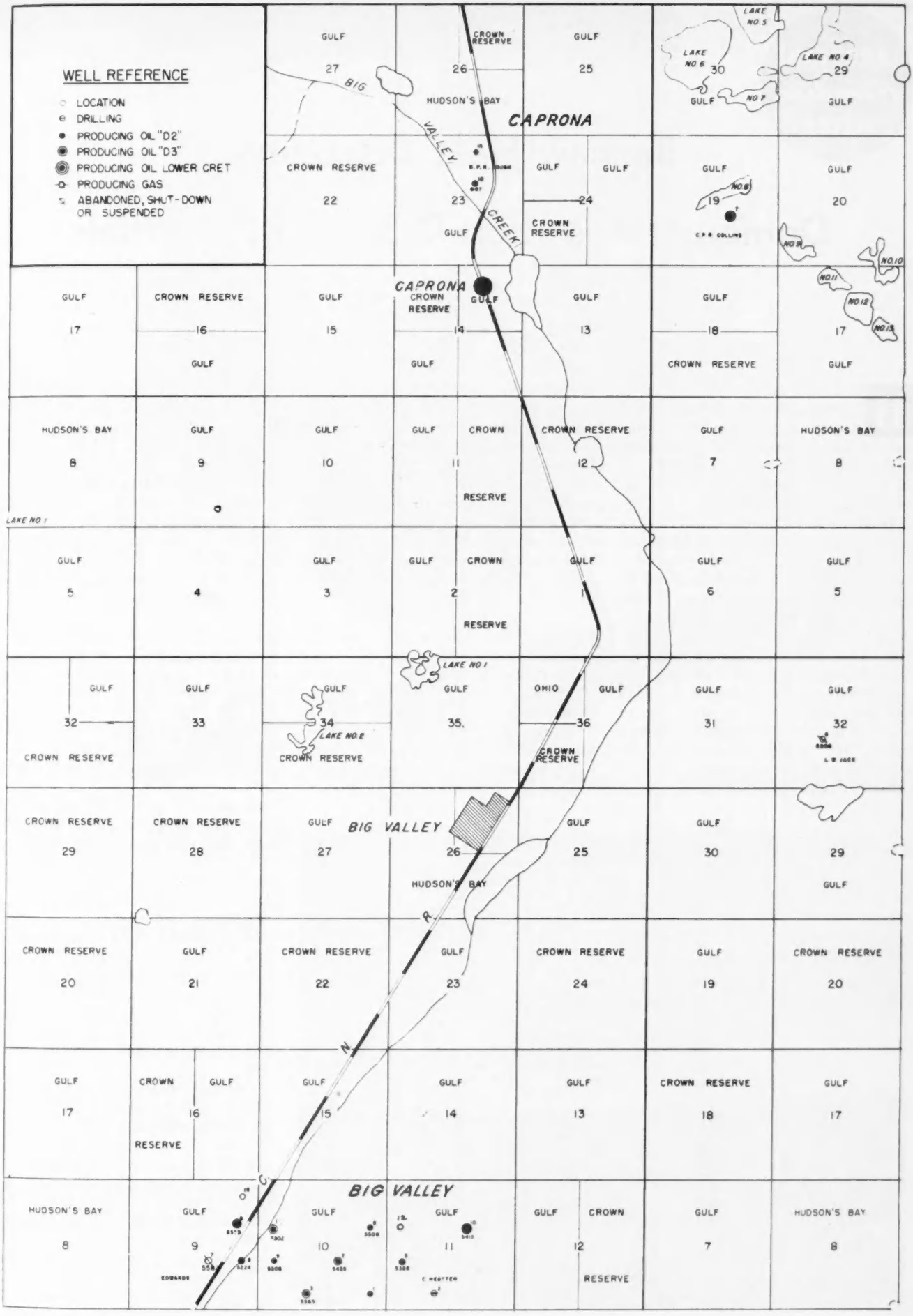
DISCOVERED in September of this year and too new for proper evaluation, the Caprona D-2 reef find, about midway in the 16-mile interval between the Stettler and Big Valley reef fields, has the earmarks of being a major 1951 development. Canadian Gulf Oil Corporation's CPR Gough 10, discovery well, is in LSD 10 23-36-20w4, situated about 90 miles northeast of Calgary, east of Red Deer. With plugged-back depth of 5298 feet, in D-2 reef, the well flowed in potential test at an estimated rate of 1788 barrels per day of 31.3-gravity clean oil through 1½-inch orifice. The well was drilled on down to the D-3 but found that zone wet, so it was plugged back and completed in the D-2. It was placed on production in early October and the operator immediately spudded in on a north offset to the discovery.

Of importance in this find was the 84-foot thickness of the D-2 pay zone, which is more than the general average of the thickness of the equivalent zone in either the Stettler field to the north and the Big Valley field to the south. Both of these fields, however, have production in the D-3 reef, in addition to D-2 production. Gulf is expected to drill another wildcat in the general area, the site falling in LSD 2 9-36-20w4, about 3¼ miles southwest of the Caprona discovery. Lower Cretaceous production previously had been established in the D-2 reef discovery area. Canadian Gulf was testing a marginal Lower Cretaceous well, drilled earlier, about two miles east and a little south of Caprona reef find. Low porosity of the zone is blamed for the small output of this well.

PRODUCTION DATA: Thickness of determined pay and the north offset well which had reached 4900 feet and which was checking out higher on structure than did the discovery well combine to paint an optimistic outlook for the field. The offset could mean, also, that the D-3 zone, wet in the first well, might be productive farther up structure. The discovery was shut in and no official allowables set. The crude is relatively sweet, containing only about 1 percent hydrogen sulfide. Casing program used has been to set 10¾-inch surface, then drill 9-inch hole and set 7-inch oil string to total depth, gun-perforating the pay with four bullets per foot and swabbing the well in.

DRILLING DATA: Medium size, diesel powered rigs are used in the area. Drilling conditions are typical of the region and present no particularly serious problems in either mud control, blowouts or danger of lost circulation. Some circulation is lost in the D-2 and D-3 zones, a condition fairly common to the reef in the area. Drill pipe of 4½-inch size, with about four 6-inch drill collars, is used. About 18 rock bits, excluding core heads, are used to drill through to the D-2 zone. Typical rotary speed is 120 revolutions per minute and about 30,000 pounds is carried on the bit. Surface string is cemented to the surface and about 550 sacks are used to cement the seven-inch to a point above the Viking gas sand.

No fishing jobs of consequence have been experienced. Average rigging-up time is about two days, and drilling time averages from four to five weeks. One mud pump usually is used and two blowout preventers are installed. Water is obtained from nearby ponds or lakes. Nearest machine shop facilities and supply centers are at Stettler, 16 miles to the north, or at Edmonton. Terrain is rolling. Roads in the field are graded gravel or dirt.



CAPRONA FIELD AREA

IMPORTANT *Canadian* FIELDS

Bashaw Field Discovery

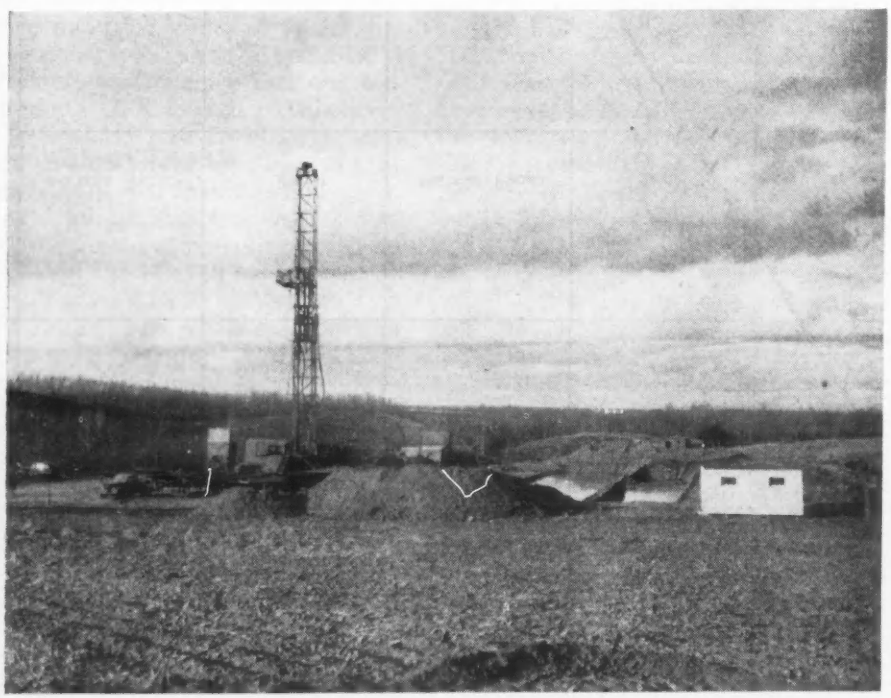
Demonstrates High D-3 Reef Potentials

BASHAW AREA, discovered in July by American Leduc Oil Company and Yankee Canuck and Mining Corporation's American Leduc 1, is about two miles southwest of the town of Bashaw, which is southeast of Wetaskiwin.

With 19 feet of Devonian D-3 pay zone open from 5800 to total depth of 5819 feet, the discovery showed a large volume of gas and some oil in the upper part of the interval and flowed a large volume of oil, with little gas, from the lower part of the hole. The operators' second well, No. 2, with total depth of 5781 feet, was completed with a potential of 1332 barrels per day rate on the basis of an eight-hour test through 21/64-inch choke. Open flow was estimated to be about three times this figure.

Size of initial production of the first wells has brought a surge of drilling activity to the area, with four rigs running in October and a number of locations staked. American Leduc, Hudson's Bay Oil & Gas Company and Canadian Gulf Oil Corporation were drilling offsets on the west, east and northeast, respectively, of the discovery well. Stanolind was planning a test less than a half-mile southwest of the American Leduc 2 producer.

Other activity in the area includes Spooner Oils—Target Oils 1 stepout 3½ miles south and east of the initial Bashaw discovery area. This test is slated to drill to the D-3 at a point about three-fourths mile southwest of a Standard Oil Company of California abandoned wildcat which found a large amount of gas, together with a small (non-commercial) quantity of oil in what is believed to be the same D-3 zone that now produces in the Bashaw discovery area.



This well is seeking crude from Devonian D-3 reef at a depth of slightly more than 5000 feet.

PRODUCTION DATA: While it is too early to obtain reserve figures, it nevertheless is felt, based on the performance of completions to date, that the Bashaw area will develop into a reserve of considerable importance. Completion practice in the area calls for 14¾-inch surface string and seven-inch oil string, the latter to total depth, after which the pay is gun perforated and swabbed in on production. The 38- to 43-gravity oil is sweet and is trucked out. Temporary allowable is 50 barrels per day per well. Wells are brought in flowing.

DRILLING DATA: Medium size, diesel-powered rigs using 4½-inch drill pipe are used for drilling the 5800-foot wells. Drilling is fairly hard and about 35 nine-inch bits are used in drilling from the shoe of the surface string to total depth. Mud control is quite critical and circulation sometimes is lost in the surface hole. Two mud pumps are used, one for circulating and one for mud mixing. Two blowout preventers are used. No fishing jobs of consequence have occurred. Typical rotary speeds are 80 to 150 revolutions per minute. Average rigging-up time is three to four days, and from seven to eight weeks is required to drill and complete a well.

Drilling water supply is hauled from a lake about seven miles distant. Nearest oil field supply point is at Stettler, about 38 miles to the southeast. Roads are graded gravel to the field, and graded dirt within the area. Crews generally live in Bashaw, Mirror or other nearby towns. Prevailing footage rates vary from $7 to $8, with day work bringing from $750 without drill pipe to $850 with drill pipe, with figures varying up or down by perhaps $50. Terrain is gently rolling.

(SEE MAP, PAGE 270.)

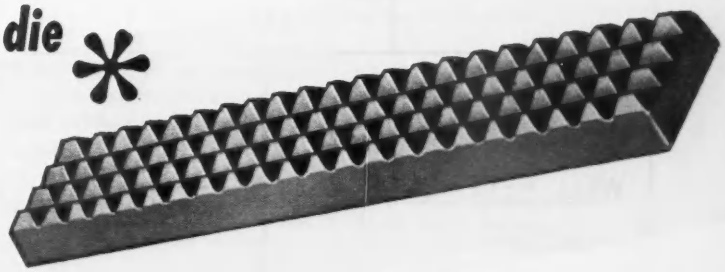
Be on guard

Not all tong dies with pointed teeth are

WEB WILSON THE ORIGINAL PYRAMID TOOTH TONG DIES

Here's the genuine Tiger Tooth die*

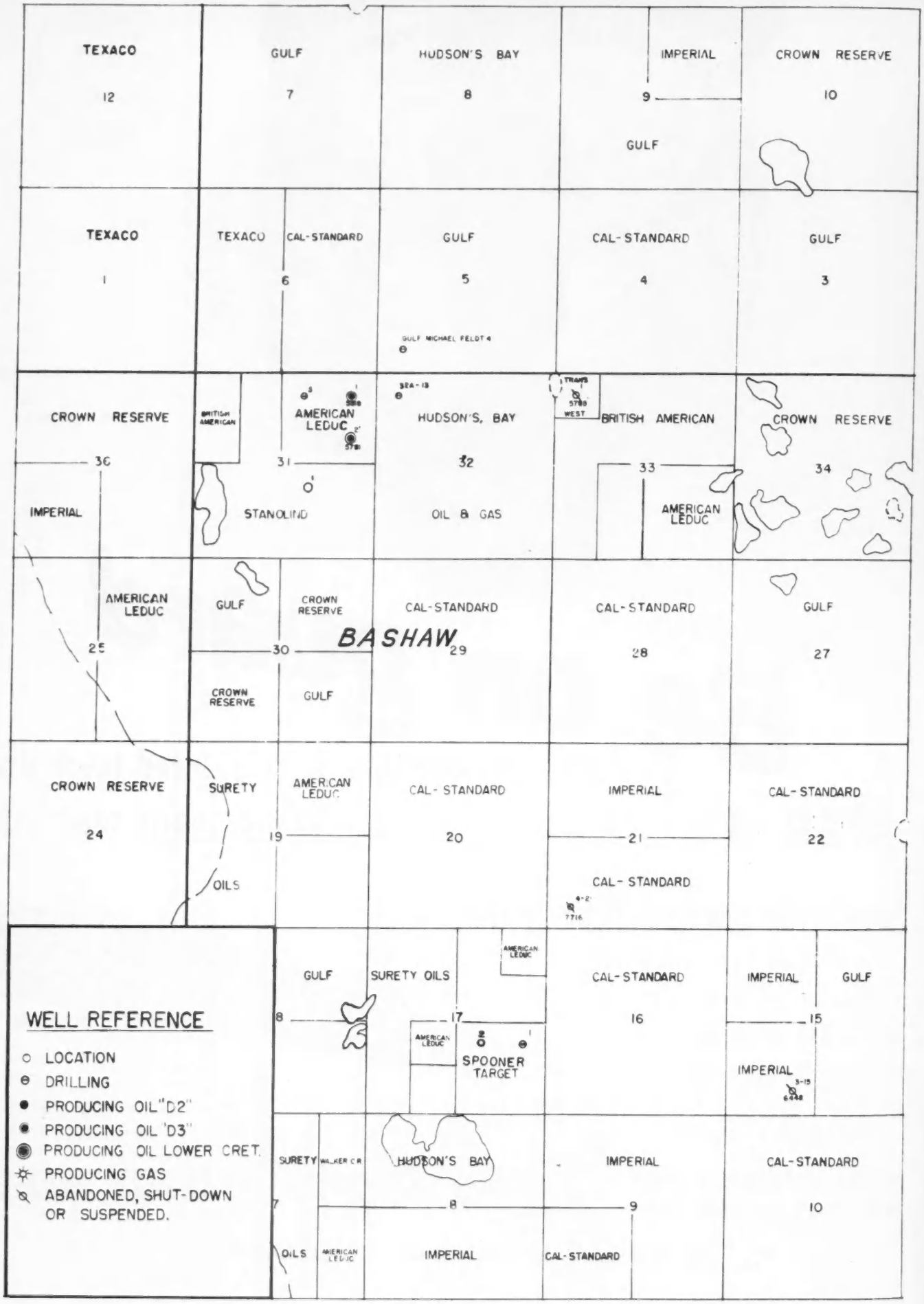
Fast-moving crews *know* they grip instantly—won't slip—and last lots longer. ★ Be sure you get the box with the yellow and black "Tiger Stripes"—the *best* dies ever made.



YOUR SUPPLY STORE HAS ALL SIZES OF— "Tiger Tooth" TONG DIES

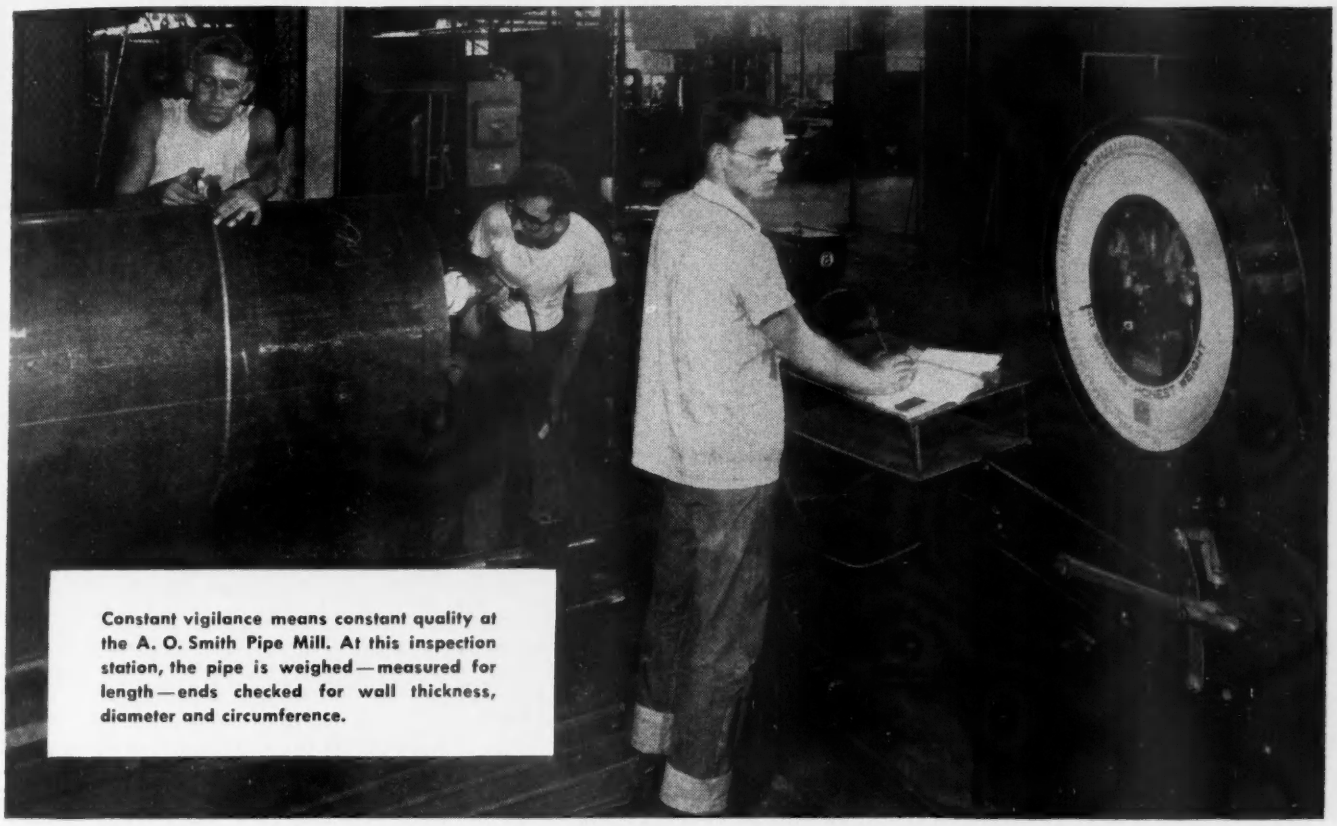
BE SAFE • BE SMART • BE ECONOMICAL

WEB WILSON Oil Tools INC. FIELD PROVEN **BOX 96, LOS ANGELES 2, CALIFORNIA**



BASHAW FIELD AREA

FIRST names in pipelines depend on the FIRST* name in line pipe



Constant vigilance means constant quality at the A. O. Smith Pipe Mill. At this inspection station, the pipe is weighed—measured for length—ends checked for wall thickness, diameter and circumference.

A. O. Smith contributes toward lower pipe line installation costs

Uniformity contributes to the quality of the pipe and thus reduces the cost of installation. Uniform, round ends of consistent wall thickness makes for faster lineup in the field—simplifies the welding procedures—reduces total installation time. These are important contributions toward reducing the overall cost of the pipe line—an economic advantage enjoyed by A. O. Smith customers.

To Begin With, plate is used that comes from the mill in uniform thickness and permits careful inspection of both surfaces.

Then our internal expanding process (in use by A. O. Smith for over 20 years) makes certain the pipe is round, straight and of uniform diameter.

Finally complete inspection both during manufacturing process and after finishing makes sure that all pipe shipped meets the high standards established by A. O. Smith.

* FIRSTS by A. O. Smith • Welded line pipe • Internal expanded pipe • Light wall large diameter pipe • World's largest producer of large diameter welded steel pipe.

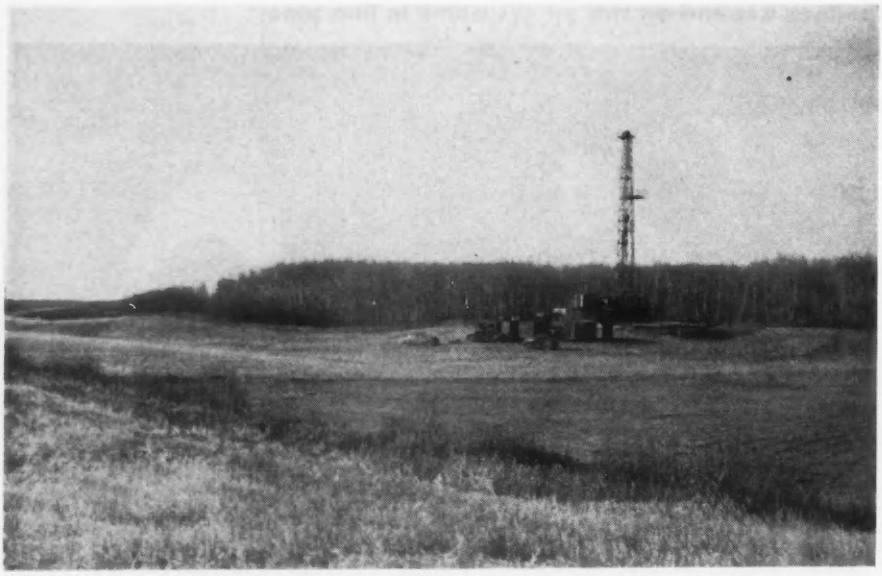
A.O. SMITH 77th ANNIVERSARY 1874 - 1951

DEPENDABILITY *through* **RESEARCH** *and* **ENGINEERING**

A.O.Smith

LINE PIPE • CASING

Chicago 4 • Dallas 2 • Denver 2 • Houston 2
Los Angeles 22 • Midland 5, Texas
New Orleans • New York 17 • Pittsburgh 19
San Francisco 4 • Seattle 1 • International Division: P.O. Box 2023, Milwaukee 1



IMPORTANT Canadian FIELDS

View of drilling well which is north offset to Armena area Viking sand discovery 30 miles southeast of Edmonton. This well subsequently was successfully completed.

Armena Field Is Promising New Viking Sand Discovery

THE Armena discovery is considered the best Viking sand oil discovery of the year. Situated about 30 miles southeast of Edmonton, the oil discovery is the third from the Viking within a 16-mile strip of territory between the 65-well Joseph Lake Viking sand field to the northwest and the seven-well Camrose Viking sand pool six miles to the southeast. The Armena discovery was drilled in September by Western Homestead-North Canadian Oils-Petcal's Armena 2.

The discovery was made following the finding of some non-commercial oil shows in several dry holes drilled in the area. The discovery was officially estimated at about 550 barrels daily of 37.6 gravity oil.

Pay zone penetrated in the discovery well was 15 feet thick, the well having found no water at total depth of 3263 feet.

The north offset to the discovery well, the same company's Armena 3, completed in October at 3277 feet, penetrated the zone about 20 feet without encountering water. This second well topped the pay about ten feet higher structurally than in No. 2. These pay thicknesses exceed the average 11-foot thickness of the Joseph Lake field and the approximate five-foot thickness of some wells in the Camrose area.

Rapid development of the area is seen in the immediate staking of a third well west of the second producer and the announced intention of another independent operator to drill a quarter mile south of the discovery well. Diversified ownership of acreage in the immediate vicinity probably will result in rapid field development. Spacing is on a 40-acre pattern. A previous deep test in the area, drilled to 4800 feet, encountered no reef so the prime objective will be the Viking sand in this particular region.

PRODUCTION DATA: With the greater thickness of pay, as compared to Joseph Lake and Camrose, the new area would seem to hold promise as a substantial producer. Structure is considered a stratigraphic trap, with shaling out of the sand occurring at the sides. Joseph Lake is estimated to have reserves of about 400 barrels per acre foot and, on that basis, it is believed Armena recovery will exceed that figure.

Typical casing program in the area is to set 10¾- or 9⅝-inch surface string at about 160 feet, then seven-inch or 5½-inch oil string to total depth, after which the pay interval is gun-perforated with four holes per foot. Surface string usually is cemented to the surface and the oil string cemented with from 120 to 300 sacks. Wells are swabbed in and a service rig generally is moved in to clean out and put the well on production.

The 37.6-gravity crude is sweet. Bottom-hole pressure, flowing, is around 850 pounds per square inch. Trucking is the only outlet for the crude at present, but it is anticipated that an extension of the Joseph Lake-Edmonton pipe line ultimately will be laid into the Armena area. Market allowable of wells is expected to be about 75 barrels per day.

DRILLING DATA: Light, jackknife type rigs are used. Drill string usually is 3½-inch drill pipe with two 6-inch drill collars. Drilling is considered easy for Alberta, with average completion time, from spudding-in to completion, being about 14 days. About three rock bits and one core head are used in drilling the 8½-inch hole below the surface string. Coring generally is started at around 3240 feet. No critical mud control or circulation problems exist. Ordinary clay mud, with some gel and quebracho, is used. Typical rotary speed is 175 revolutions per minute and from 16,000 to 18,000 pounds is carried on the bit. No fishing jobs of importance have occurred. Rigging-up time for the light rigs is about one day.

Rigs are diesel powered. One mud pump is used for both circulating and mud-mixing. One blowout preventer is used. Mud ditches are excavated. Ample drilling water from local ponds or lakes is available within a mile. Nearest supply center is Edmonton. Roads are graded gravel or dirt in the vicinity of the field, but paved between Camrose and Wetaskiwin. Terrain is gently rolling. Prevailing footage rate is about $5, with hourly rates being from about $25 without and $30 with drill pipe.

(SEE MAP, PAGE 274.)

ORBIT® VALVES

again Selected by Major Natural Gasoline Producer

Warren Petroleum Corporation, one of the largest manufacturers and exporters of Natural Gasoline and LPG Products has completely equipped the above Loading Pumps and Manifold installation, Holliday Plant No. 27, with Orbit Forged Steel LP Gas Valves.

More and more LP Gas manufacturers are turning to Orbit because the Orbit resilient friction free seating principle is a natural for handling Liquefied Petroleum Gases. Regardless of minor body deflections, contractions or expansion brought about by fluctuating temperatures or pressures, the Orbit Seating Principle is not affected. You can depend on Orbit Valves in an emergency. No lubricant of any kind is required in the valve body to effect a shut-off, therefore maintenance of the Orbit Valve requires a minimum of expense and attention.

Offered in Carbon or Stainless Steel Trim—maximum working temperatures of 250° Fahr. or 375° Fahr. Sizes 1" to 4" inclusive. ASA Class.

BRANCHES

HOUSTON, TEXAS
407 Velasco
(Serving the Gulf Coast)

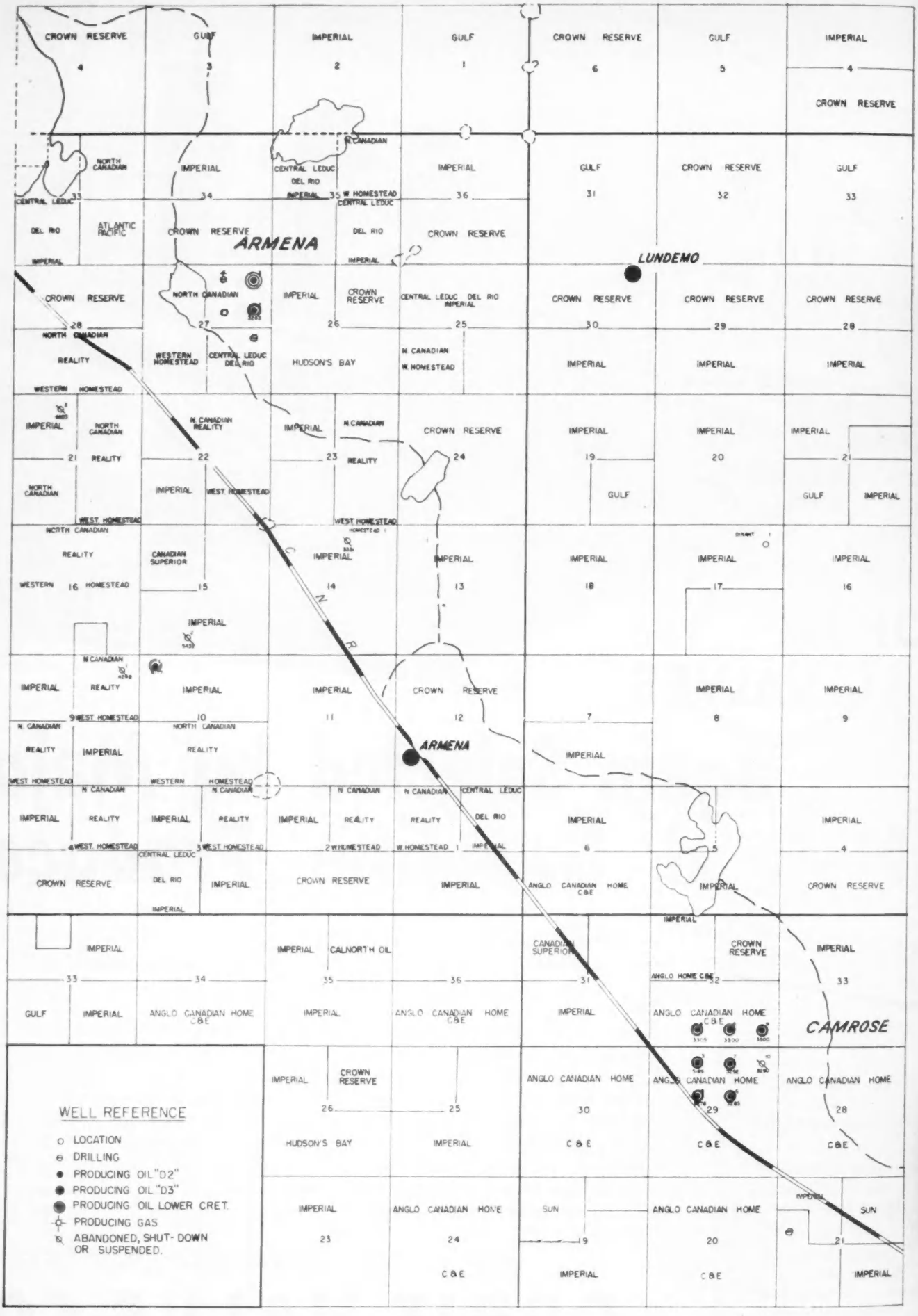
ODESSA, TEXAS
Starr Warehouse
(Serving West Texas)

CASPER, WYOMING
The Great Western Co.
(Serving the Rocky Mountain States and Canada)

SOLD BY SUPPLY STORES

ORBIT VALVE CO.

P. O. BOX 699 **TULSA, OKLAHOMA**



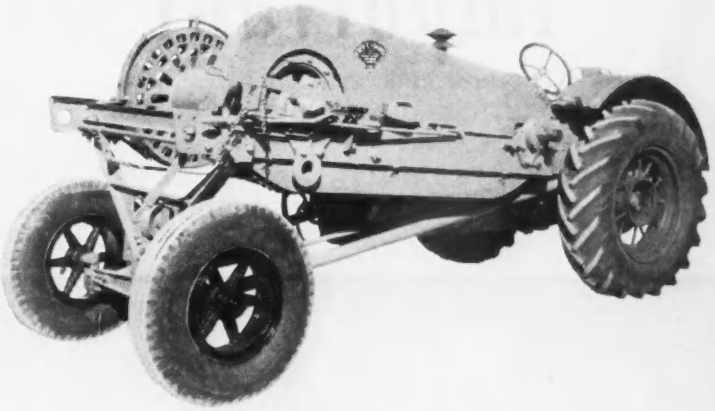
ARMENA FIELD AREA

FRED E. COOPER INC. TULSA
HOUSTON · ODESSA · LOS ANGELES
DRAW WORKS
SPUDDERS
WINCHES
POWER UNITS

COOPER—ALLIS-CHALMERS
Well Servicing Winch Tractors

WHY BUY A TRUCK?

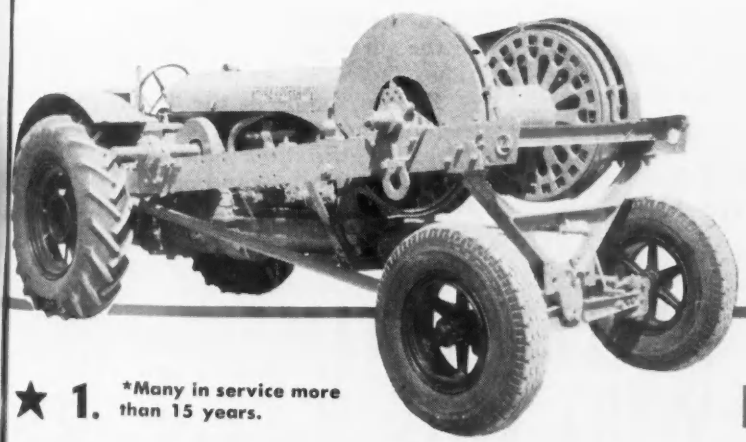
You can buy a Cooper—Allis-Chalmers self-propelled well servicing tractor unit for less than the cost of a servicing unit mounted on a truck!



LOWEST COST
Complete Servicing Units

All in one package—only one piece of equipment to buy and maintain—built for long life* and tough going in mud, sand, and rough terrain they plough right on through. On the road they are fast—15 m.p.h. or 30 m.p.h.**

At the well they are fast and safe, air-controls, 8 line speeds, large extra capacity brakes.



A SIZE FOR EVERY JOB
Basic Models:

Model W for wells to 3000′
Model M for wells to 4000′
Model E for wells to 5000′
Model L for wells to 10,000′, serving 2½″ upset tubing.
Model D-5000 for deepest servicing, work-over and drilling to 5000′ with 4½″.

All models built in Single or Double drums. Can be equipped with telescoping mast, spudding equipment or rotary drive.

Write for Complete Specifications on Any Unit

★ 1. *Many in service more than 15 years.

★ 2. **Optional speeds available.

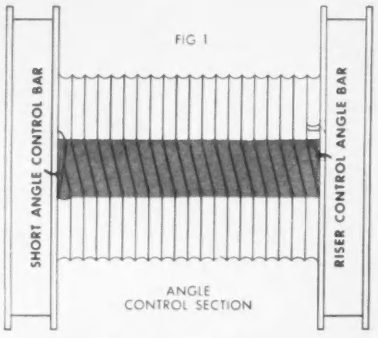
FRED E. Cooper, Inc.

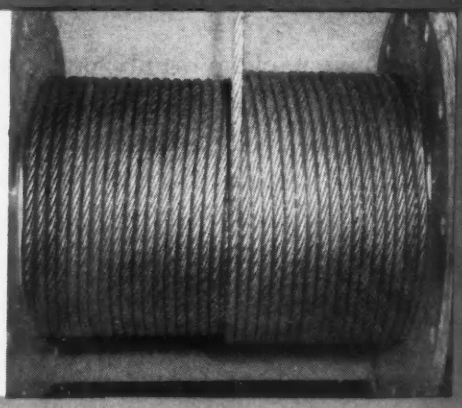
P. O. Box 1890 TULSA, OKLA.
Houston, Odessa, Los Angeles
Western Canada: Rocky Mountain Supply Co., Ltd., Calgary, Edmonton, Redwater

A new improvement...hailed by Oil Men...as a Major and Important Development...!

LeBus Controlled Pyramid

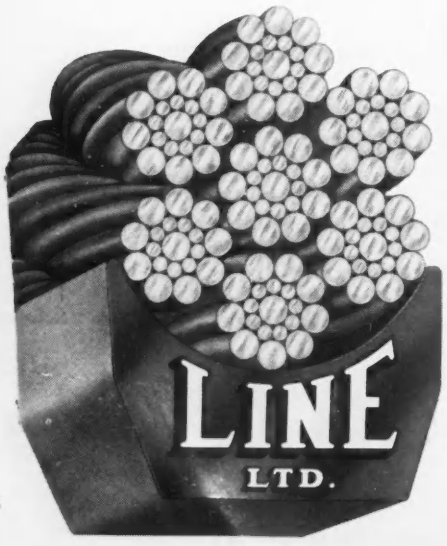
HOW THE NEW *LeBus Grooving System* WORKS





The above line drawing shows the 15% circumference of the drum taken up by the Angle Control Kick-Over segment of grooving as indicated by red shading.

In the photo above you see the wire line being wrapped on the Short Angle Control Kick-over Side of the drum. Note how the line crosses over within the same limited area on first, second and all succeeding wraps.



SAVE DRILLING TIME.....
SAVE WIRE LINE.....
SAVE ON CREW ACCIDENTS

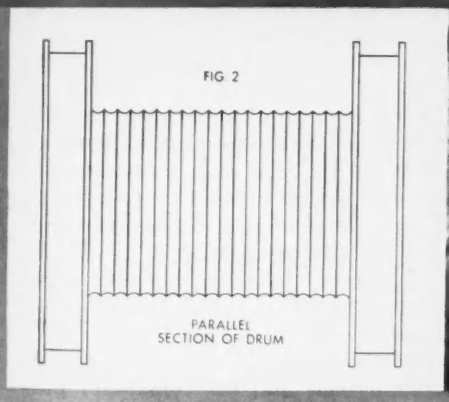
Just as the title indicates—LeBus has now developed a system of spooling wire line where each wrap of line runs PARALLEL up to 85% of the circumference of the drum giving a maximum of true PYRAMID SPOOLING. This system has proved to be the most outstanding improvement in years for spooling wire line.

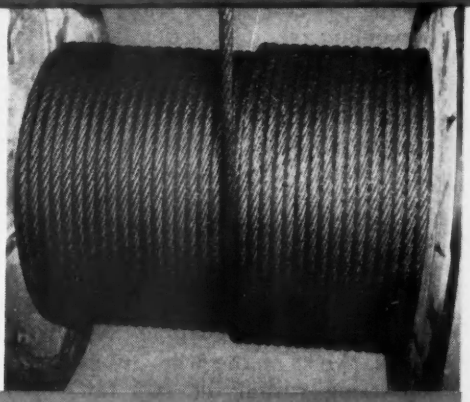
The helical angle which wire line has always been spooled in the past is now eliminated with the LEBUS CONTROLLED PYRAMID GROOVING AND SPOOLING SYSTEM. This system of wire line spooling has been developed by the use of new style angle control bars, which are placed against each flange of the hoisting drum. Angle control segments are installed all the way across the drum between the angle control bars as illustrated below in Fig. 1. This angle control section gives the wire line an abrupt turn (Fig. 1) within a limited area, creating parallel spooling (Fig. 2) for approximately 80 to 85% circumference of the drum. The System makes each layer of wraps form a groove for the next layer. The other 15% circumference is used for the ANGLE CONTROL KICK-OVER for making the line progress across the drum in the new line spooling method. This KICK-OVER of the line is in the same limited area on the drum on every layer. This new system has completely eliminated the double wave and the majority of wireline whip which is common factor in helical spooling. With helical spooling, it was difficult to actually get true PYRAMID SPOOLING. The maximum of true PYRAMID SPOOLING is attained with the LeBUS CONTROLLED PYRAMID GROOVING AND SPOOLING SYSTEM. Grooving the drums with this new system further prevents pinching, squeezing, crowding and misshaping of the wire line, all of which happens when your line is coiled on a plain or flat drum.

The controlled contact and even loads of a LeBus CONTROLLED PYRAMID GROOVING and SPOOLING SYSTEM means LONGER LIFE for Wire Line plus SAFER AND MORE ECONOMICAL DRILLING OPERATIONS.

WIRE LINE GROOVING & SPOOLING SYSTEM

PATENTED AND OTHER PATENTS PENDING





This line drawing shows the back side of the drums with the Parallel Grooved Segment running parallel with the Flanges of the drum.

This photo illustrates the Wire line being spooled on the parallel side of the drum. Note how evenly this line is being spooled. The even spooling is due to the fact that each layer of line forms a groove for the succeeding layer of line.

COMPLETE SALES & SERVICE EVERYWHERE

SALES REPRESENTATIVES

CALIFORNIA AREA:
Coastal Engineering
Sales & Service
P. O. Box 1618
Bakersfield, Calif.

PERMIAN BASIN AREA:
Kenneth C. Slough
Sales Only
612 West Kansas
Midland, Texas
ROCKY MT. and

CANADA AREA:
Fred S. Dewel Specialty Co.
Sales & Service
Casper, Wyoming

OKLAHOMA AREA:
M-C-M Machine Works
Sales & Service
P. O. Box 4583
Oklahoma City 9, Okla.

ARK.-LA.-MISS. AREA:
H. C. Stewart Specialty Co.
Sales Only
327 Montgomery Street
Shreveport, Louisiana

EAST TEXAS AREA:
Karl Flanders
Sales Only
700 Oakdale
Longview, Texas

GULF COAST and
OLD MEXICO AREA:
Petroleum Engineering
& Tool Company
Sales & Service
5710 Harvey-Wilson Drive
Houston, Texas

EXPORT AGENTS:
Hunt Export Company
Sales Only
Room 2503, 19 Rector St.
New York, New York

SERVICE INSTALLATION SHOPS

LeBus Rotary Tool Works, Inc., Arkansas-Louisiana-Mississippi-East Texas Area, Longview, Odessa, Texas; M-C-M Machine Works, Oklahoma City, Oklahoma; Petroleum Engineering & Tool Co., Houston, Texas and all Gulf Coast; Coastal Engineering Company, Bakersfield, California; Fred S. Dewel, Casper, Wyoming.

COMPLETE LITERATURE UPON REQUEST

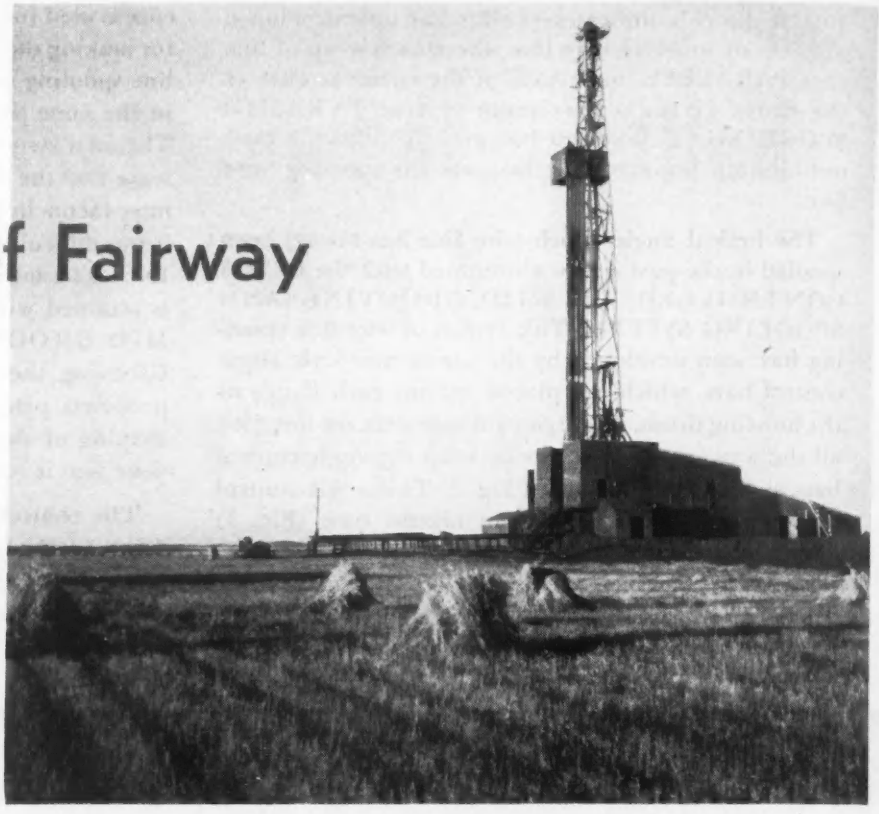
LEBUS INTERNATIONAL ENGINEERS LIMITED

Executive Offices: 300 Wichita National Bank Bldg., WICHITA FALLS, TEXAS
Service Control and Warehouse Stock: LONGVIEW, TEXAS

Canada's Reef Fairway Due for Big Year in '52

By L. F. FRANTZ, Co-Editor

Daily Oil Bulletin, Calgary



Typical of many such scenes in western Alberta is this view of a wildcat in the Drumheller area. One of the newest Devonian reef discoveries, this area is one of the most southerly of those fields extending along the reef fairway.

DEVONIAN limestone reef is the most sought-for-oil objective in Western Canada. In a Canadian prospecting "fairway" approximately 1000 miles long and averaging about 200 miles wide, more than 18 Devonian oil discoveries have been made. Numerous discoveries of oil in formations other than the Devonian also have been made, boosting total oil discoveries since the Leduc oil find in 1947 to about three dozen.

The central portion of the Alberta Basin is the most prolific source of Western Canadian Devonian oil to date. Reason for this may be that it has been explored to a greater extent than other sectors of the west.

Canada's first Devonian reef oil was developed at Norman Wells in the Northwest Territories, more than 1000 miles northwest of Calgary. This discovery was made in 1920, and the field now has around 40 producing wells. The southernmost Devonian producing area on this rapidly-developing reef fairway is at Princess, 140 miles east and slightly south of Calgary. This Devonian oil pool was found in 1942. While the field was small, it did prove to be an important milestone as it established the presence of Devonian oil on the plains of Alberta.

Following the Princess strike, the Devonian formation became an objective of a score of deep wildcats drilled on the Alberta Plains, but principal emphasis still was placed on the shallower formations above the Devonian.

IN A CANADIAN prospecting "fairway," 1000 miles long and averaging 200 miles wide, 18 Devonian oil discoveries have been made. Discoveries of other formations have combined to boost the total discoveries since the Leduc strike in 1947 to approximately three dozen. And the end is not in sight. More than 150 geophysical parties are operating in Western Canada, and slightly less than 50 percent of Alberta's 177 drilling rigs are working on wildcat ventures. Most of the wildcats are operating within the reef fairway, only a small amount of which has been explored. Though the nation's oil industry is operating at a record level and discoveries of oil are being made at the highest rate in Canada's history, the discovery rate is expected to rise even more. And it is certain that the rapidly shaping-up reef fairway will provide a large proportion of new discoveries in 1952.

In February, 1947, the Devonian suddenly became the No. 1 objective when Imperial-Leduc 1, discovery well of the Leduc field, 20 miles southwest of Edmonton came in flowing Devonian reef oil at the rate of 1000 barrels per day. This Leduc Devonian oil strike set off a rash of exploration activity which ultimately resulted in a series of new oil and gas discoveries and extensions in Alberta.

By mid-October of this year, there were 755 producing wells in the Leduc region, with more than 95 percent of those wells producing oil from Devonian reef, and the remainder producing from the Lower Cretaceous. Approximately 20 percent of Canada's more than 200 drilling rigs are operating in the Leduc region, and numerous extensions still are being made in this area—an area still deemed favorable for exploratory operations. Full extent of the various pools discovered in this region has not yet been determined.

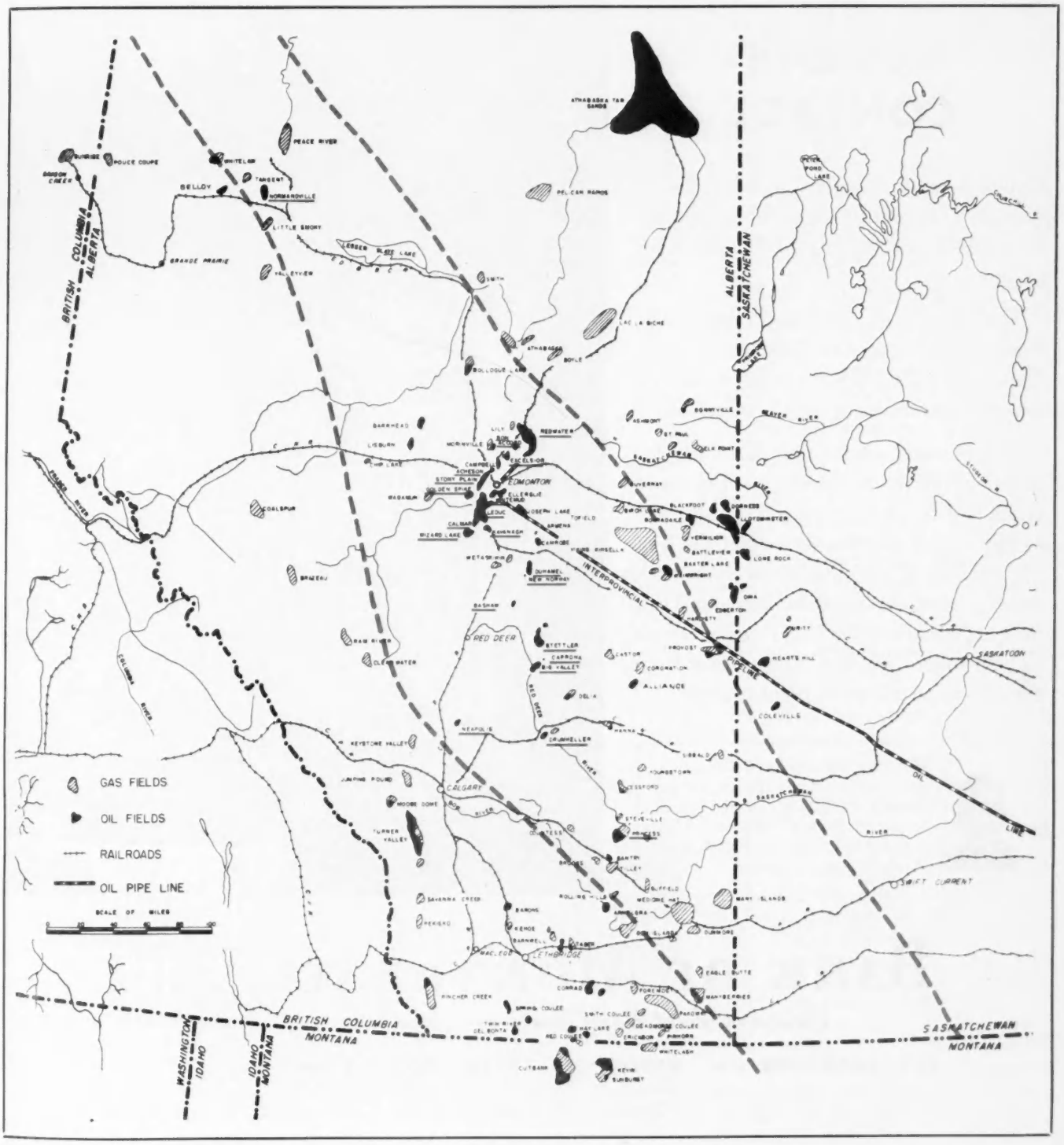
Leduc was Alberta's first major Devonian reef oil strike. In September, 1948, came the province's second major reef oil field, at Redwater, about 30 miles northeast of Edmonton. Leduc-Woodbend oil occurs in the D-2 and D-3 zones of Devonian, at around 5000 feet. At Redwater,

however, oil was found in only the D-3 zone of Devonian reef and at around 3100 feet. Redwater, a shallower field, now is practically drilled up after three years of development drilling. The field currently has 893 producing wells. It is expected that very few more successful completions will be drilled in this field, which is considered Canada's largest oil reservoir. The D-3 pay at Redwater has a thickness of up to more than 200 feet, while at Leduc-Woodbend, pay thickness is around 30 to 40 feet.

By 1949, exploration work along the reef fairway was progressing at a record rate and in that year important Devonian oil discoveries were made at Stettler and Golden Spike. The Stettler discovery, about 93 miles southeast of Edmonton, marked a significant movement to the south and east. It increased interest in the southern sector of Alberta, and made this region appear more promising for oil prospecting. Also in that year, the thickest oil-bearing reef up to that time was discovered at the famed Golden Spike wildcat. A thick but pinnacle-like reef was found at Golden Spike, with the most profific well showing slightly more than 600 feet of oil pay zone. Golden Spike reef is several miles northwest of the Leduc field.

Since 1949, a string of reef discoveries has been made along a wide belt stretching between Leduc and Redwater on the north, Drumheller on the southeast, and Neapolis to the southwest. This belt is now generally labeled the reef fairway.

During the past month, at a location about five miles southwest of the southern portion of the Leduc field,



Devonian reef fields underlined in red. Dash outlines indicate probable extent of reef.

BANKS DON'T GET *Oil-Wise* BY REMOTE CONTROL

Unless a bank operates in the heart of Canada's oil country—sees oil, smells oil, feels oil—it *can't* do the job it should for oil men.

The Bank of Montreal, with 129 branches right in the Prairie Provinces alone, *can* do a job for American oil men whose interests focus on Canadian oil.

If you want advice and financing for any phase of an oil operation—from lease terms and taxation to pipelines and processing—it will pay you to contact the B of M. Because of our close connections with every part of this great industry, and our long experience in the U. S., we know how to help solve Canadian oil problems from the American oil man's point of view.

FOR THE PROMPTEST RESPONSE to your inquiry, write, phone, or see Gordon V. Adams, Special Representative, Bank of Montreal, Calgary Main Office, 140 Eighth Ave., West, Calgary, Alberta.

"MY BANK" TO A MILLION CANADIANS

B of M

BANK OF MONTREAL

Canada's First Bank Coast-to-Coast

550 BRANCHES • RESOURCES EXCEED $2 BILLION

New York . . . 64 Wall Street • Chicago . . . 27 S. La Salle Street • San Francisco . . . 333 California Street

Head Office: Montreal

a tri-zone oil discovery was made. Included in this three-horizon strike was a D-3 coral reef that even surpassed the thickness of the Golden Spike Reef. The discovery was at Wizard Lake, a few miles southwest of the Leduc field, where around 610 feet of D-3 oil-bearing reef has been developed. Other production at Wizard Lake is from D-2 Devonian reef and from the Lower Cretaceous sandstone. Present indications are that Wizard Lake will develop into an oil reservoir of major proportions.

Two other recent and significant Devonian reef discoveries which have extended reef fairway producing limits are Drumheller and Neapolis. Drumheller, about 65 miles northeast of Calgary, demonstrated the possibilities of deeper drilling in a territory where previously only shallower test holes had been drilled. With the exception of Princess, Drumheller presently is the southernmost Devonian oil producing area so far discovered in Alberta. The Neapolis wet gas discovery, about 35 miles north of Calgary and just east of the foothills, shows a westward shift, into a deeper drilling area, which opens up another sizable spread of virgin reef prospecting territory. Neapolis is about 50 miles west and slightly north of Drumheller and more than that distance southwest of the Big Valley Devonian field.

Other Devonian oil discoveries made on the reef fairway during the past two years include: Acheson-Stony Plain, Excelsior, Calmar, Kavanagh, and Bon Accord, all within a 30-mile radius of Edmonton; Duhamel and New Norway, 50 and 75 miles southeast of Edmonton; Bashaw, 110 miles northeast of Calgary; Caprona and Big Valley, more than 100 miles south-southeast of Edmonton; and Normandville, in northwest Alberta, 220 miles northwest of Edmonton.

Standing in the center of an about-to-be-harvested wheat field, this wildcat is an attempt to extend production of the newly-discovered Devonian reef pay in the Drumheller area.

The D-3 or lower zone of the Devonian reef is the most prolific source of oil in the Leduc-Woodbend and Redwater belt of the reef fairway. D-3 is responsible for the huge oil reserve at Redwater, and it is the D-3 which has the record-breaking thickness of oil-bearing reef at Wizard Lake and Golden Spike.

In the southern fields, such as Stettler, Big Valley and Duhamel, the D-2 zone is the most important reservoir. Wells in the D-2 in these fields appear to be comparable to the average of the northern D-3 producers.

Intense Exploration Activity

At mid-October of this year there were about 90 seismic crews exploring in the province of Alberta, with the greater percentage of them operating within the boundaries of the approximately 200,000 square miles contained in the northwest-southeast trending reef fairway. Gravity meter and magnetometer crews boost the province's total of active geophysical parties to more than 105. Western Canada's total active crews are now in excess of 150.

More than 40 percent of Alberta's 177 drilling rigs are working on wildcat ventures, with most of those rigs operating within the confines of the reef fairway.

Only a comparatively small amount of Western Canada's reef fairway has yet been explored. Though the nation's oil industry is operating at a record level and discoveries of oil are being made on an average of one per week, the highest rate in Canada's history (natural gas discoveries are being made at even a higher rate), it is anticipated that the discovery rate will continue to climb. It is certain that the rapidly shaping-up reef fairway will provide a large proportion of discoveries during the coming year.

Typical well in the Acheson-Stony Plain area about ten miles west of Edmonton. Objective is the Devonian D-3 reef at approximately 5100 feet.

Interested in Canada's Oil Fields?

Then send for these two informative brochures:

- American Oil Interests Entering Canada
- Memorandum on Income Taxes and Other Legislation Affecting Canadian Enterprises

PEOPLE throughout the United States have written to The Bank of Nova Scotia for these two brochures which contain information essential to anyone interested in Western Canada's oil fields.

The brochures include information on:

- Crown lands, Leases and Mineral Rights
- Foreign Exchange
- Income Tax
- Labour Conditions
- Import Regulations and Duties on Drilling Rigs, Personal Effects, etc.
- Licenses
- Plus many other items of interest to our U. S. friends who wish to be informed on these important developments

We shall be pleased to send you your copies on request. And should you want further information concerning Canada's oil situation, do not hesitate to write again. Address enquiries to:

The BANK of NOVA SCOTIA*

GENERAL OFFICE, TORONTO, ONTARIO

IN ALBERTA

H. A. BELL
Manager, Calgary

N. R. CAMPBELL
Manager, Edmonton

* With over 380 branches in Canada and abroad and Correspondents wherever men trade.

REDWATER REVIEW

By R. D. KNOWLES

Reservoir Engineer, Imperial Oil Limited, Calgary, Alberta

DISCOVERED IN 1948, Redwater field has undergone rapid development, with 753 wells completed by the end of 1950. Approximately 925 will have been drilled by the time the pool's limits are delineated. A pressure drop of 209 psig has been noted since the discovery, with the last average field pressure recorded in August, 1951, being 841 psig. A pressure maintenance project probably will be necessary early in 1953 to recover maximum oil from the reservoir and to sustain high individual well producing rates.

REDWATER field's discovery well, Imperial Redwater 1 (Figure 1), was brought into production during October, 1948, opening up 131 feet of productive porous lime in the Leduc member of the Upper Devonian. Total depth was at 3264 feet, 14 feet below the oil-water contact. Subsequent to initial production tests, casing was perforated over the productive interval and acidized. The initial production was gauged at 1720 barrels per day of water-free 35 gravity oil with a gas-oil ratio of approximately 190 cubic feet per barrel.

Two stepout wells, Imperial Egremont 1 and Imperial Amelia 1, were drilled approximately 4½ miles northwest and southeast, respectively, of the discovery well. Successful completion of these wells, followed by a two-mile stepout west of Imperial Redwater 1, and a failure four miles north, determined the approximate strike and dip of the pool. Development proceeded rapidly on a 40-acre spacing program. A further successful stepout of approximately four miles southeast was made by Imperial Simmons 1, south of the Saskatchewan river, in October, 1949. Development continued rapidly, with 753 wells completed by the end of 1950. Approximately 925 will have been drilled by the time the pool's limits are delineated. The pool, about 17 miles long and three miles wide, is about 40 miles northeast of Edmonton in north central Alberta.

A summary of the basic reservoir data for the Redwater pool is shown in Table 1.

Production from Redwater is from the Leduc (D-3) member of the Woodbend formation of Upper Devonian age. Top of the D-3 over most of the pool is impermeable limestone, which, together with overlying green shale, acts as cap rock. This tight D-3 zone averages 30 to 40 feet thick on the west side of the pool and thins out on the east flank to practically nil. Most of the void space in the reservoir is caused by vugs, existing throughout the productive zone, or from the porosity of the intergranular material.

Considerable diamond coring during development drilling gave extended coverage over the entire field. Practically all core analyses were made on large cores from the diamond barrel; analyses from small cores gave erratic results. In evaluating core analyses, only those having a vertical or horizontal permeability greater than 1.0 millidarcy were considered. Porosity in less permeable sections probably contains a high percentage of connate water. The average porosity towards the east side of the field is considerably better, varying from 5 to 15 percent, than on the west side of the field where average porosity ranges from 4 to 10 percent. During the latter field development stages, quantitative analyses of radioactive logs have been used successfully for porosity determinations in preference to diamond coring.

Effective horizontal permeability is good throughout most of the formation, being of the order of 500 millidarcys. Effective vertical permeability is thought to be quite high due to vertical fracturing which is highly prevalent along the pool's east flank where the vertical influx of water has become a problem. Acid treatments of 1000 to 2000 gallons of 15 percent hydrochloric acid are sufficient, in most cases, to bring bottom hole differential pressures to ten pounds per square inch or less. In addition, specific productivity indices are greatly increased. For example, five wells selected at random from the Redwater and Amelia blocks had an average specific productivity index of .076 prior to acid treatments. After each well was treated with 2000 gallons of hydrochloric acid, the overall average index was increased to 1.74.

Analysis of bottom hole crude samples indicates there is an undersaturated crude having a bubble point pressure of 485 psig. Original reservoir pressure was 1050 pounds per square inch gauge at a datum of 1165 feet subsea.

Estimated productive area of the field is placed at 37,000 acres. Effective thickness of the oil zone for

TABLE 1

Estimated productive area	37,000 acres
Water-oil contact	1,236 feet subsea
Average oil zone thickness	93.6 feet
Oil-in-place	1,242,700,000 barrels
Connate water (estimated)	15 percent
Shrinkage factor	0.883
Average porosity	6.16 percent
Original reservoir pressure	1,050 psig.
Saturation pressure	485 psig.
Reservoir temperature	94° F.
Solution gor–flash liberation	215 cu. ft./bbl.
Average stock tank oil gravity	35

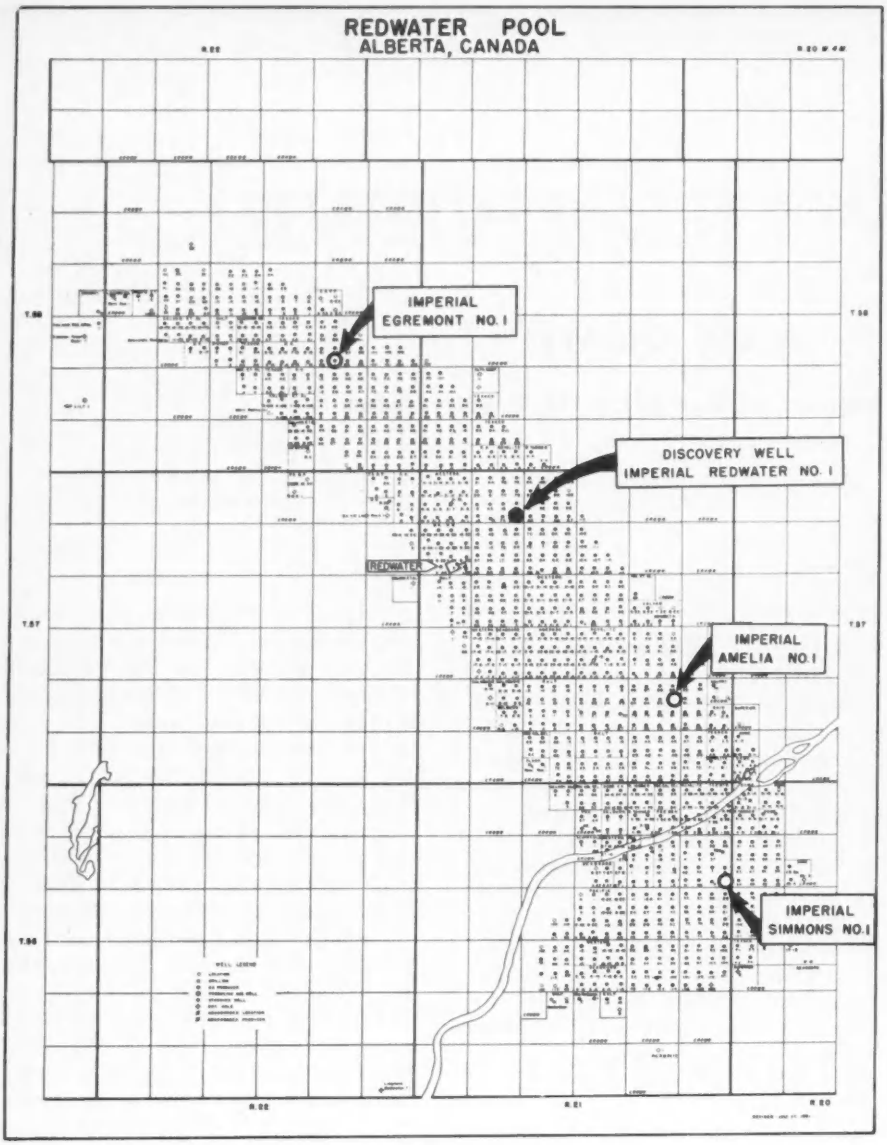


FIGURE 1

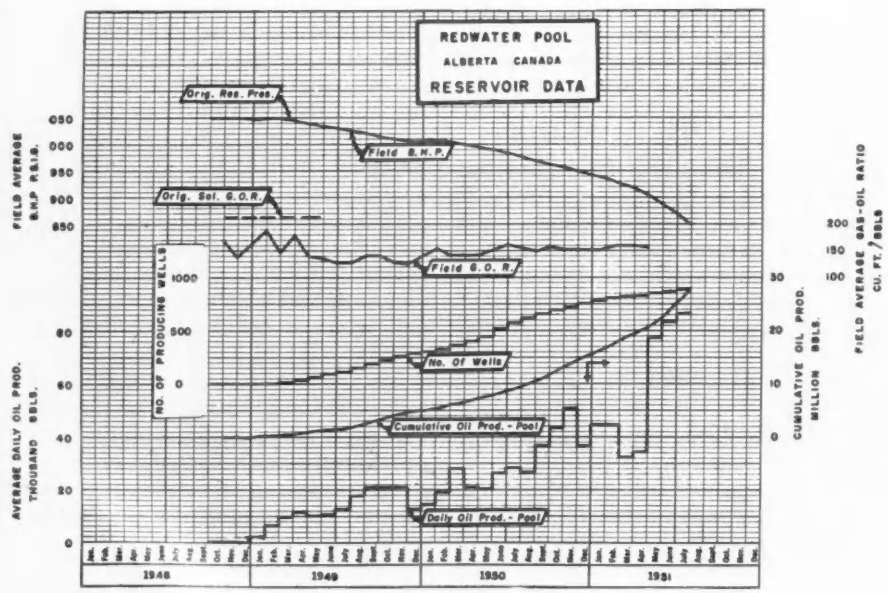


FIGURE 2

the pool averages about 94 feet and has an estimated average porosity of 6.16 percent.

Evidence to date points to a highly effective water drive in force. As a result, a recovery factor of 50 percent can be expected, providing pressure is kept above saturation point. Considering these factors and using an estimated connate water figure of 15 percent, a recovery of at least 621 million barrels of stock tank oil should be realized.

Pressure Drop

A pressure drop of 209 psig has been noted since the original discovery, with the last average field pressure recorded in August, 1951, being 841 psig. A total of 30,675,000 barrels of crude have been taken out of the field as of August 31, 1951, (note Table 2 and Figure 2). With the exception of the northern portion of the field, in the Opal and half of the Egremont blocks, pressure communication has been good. First pressure measured when bringing in the Imperial Simmons 1 extension was 1017 psig, indicating a drop of 33 psig due to drainage by the developed portion of the field. As yet no definite reason is known for the 100 psi pressure differential existing between the main and northern portions of the field. It is possible that relatively poor communication exists between the two areas; however, it may be that oil withdrawal has not been as great from the northwest section. It is also possible that the active lateral water drive is coming in from the northwest and its effects are more noticeable in this area.

All Redwater wells are pumpers. To keep expenditures for bottom hole pressure information at a minimum, a program was instigated last summer to obtain these data by sonic devices. It was appreciated that a certain degree of accuracy had been lost over results obtained by pressure bombs, but it was believed a relatively satisfactory relationship could be established. Pressure bombs will be used periodically, especially during the working over of wells, to check results.

Early in Redwater development, Imperial Waybrook 1, a dry hole about 15 miles west of the Redwater pool, was completed in the D-3 as a pressure observation well. This well is on the Morinville reef, thought to have possible communication with the Redwater reef. Completion of this well for pressure observation was a joint undertaking among Redwater operators. No measurable pressure decline has yet been noted at this well, though it is still too early to say

Speed THIS EXPLORATION STEP!

All exploration comes at last to this—the slow and rugged job of collecting facts on the ground. It's the essential step.

But today footslogging *follows* aerial exploration. Now ground crews are directed to the *most promising* areas by photo-mapping and precise aerial magnetic surveys, and there make detailed studies. Thus the difficult and expensive ground survey is expanded in effectiveness and reduced in cost, and the whole exploration effort is greatly speeded.

Aero Service, a pioneer in airborne magnetometer surveys, cuts schedules from years to weeks or months . . . and does the work at a fraction of the cost of ground surveys. AERO's magnetic intensity records are accurate within 1 to 2 gamma—a precision resulting from AERO's more than a quarter million miles of aerial exploration.

Discuss your exploration problems with AERO. Let us help you direct your ground surveys to areas of greatest interest. Our worldwide mapping experience is unparalleled.

TOPOGRAPHIC MAPS • PLANIMETRIC MAPS
PRECISE AERIAL MOSAICS • AIRBORNE MAGNETOMETER SURVEYS
RELIEF MODELS • COLOR PHOTOGRAPHY

In Canada our affiliate is CANADIAN AERO SERVICE, LTD., *348 Queen Street, Ottawa, Ontario.*

AERO
SERVICE CORPORATION
PHILADELPHIA 20, PENNSYLVANIA
Oldest Flying Corporation in the World

conclusively that no communication exists.

As indicated, a natural water drive exists in the Redwater pool. Pressure information supports this view, as the average production to date has been approximately 138,000 stock tank barrels of crude per psi pressure drop, while expansibility of the total oil volume would only be approximately 10,000 barrels per pound pressure drop. The oil section of the Redwater D-3 reef is underlaid by approximately 1000 feet of water-bearing reef and limestone. Redwater reef extends 10 to 15 miles west of the pool, and drilling in this area has shown the reef is water bearing. Thus, the water drive is, in all probability, being experienced both laterally and vertically.

Though the water influx is of considerable magnitude, possibly in the order of 90 percent of the oil withdrawals, it is evident that present withdrawal rates are such that saturation pressure will be reached early in 1953 and operating difficulties due to gas lock in bottom hole pumps will likely occur before then. It will be necessary to augment the natural water drive with a pressure maintenance program to avoid the problems of increasing gas-oil ratios, excessive water coning, and lower ultimate recovery which could be expected if production were taken at a pressure less than 485 psig.

Salt Water Production

Salt water production was almost negligible until the spring of 1951. However, with the drilling of edge locations, and the unsuccessful workovers to shut off salt water, production of water is becoming a problem to practically all operators in the field. There are now about 55 wells in Redwater making salt water. Salt water cuts of the fluid taken from these wells varies from 1 to 60 percent with the average at approximately 10 percent. Operators are investigating methods of overcoming the problem. Until recently, most of the salt water produced was disposed of in flare pits as a temporary measure.

Steps are being taken to complete plans for formation of a salt water disposal company. Engineering, legal and accounting committees have been set up to investigate problems which will be encountered.

The engineering committee is studying technical problems anticipated for any salt water, pressure maintenance or pressure restoration programs. Recommendations have been made on the location of salt water disposal wells. In addition, all disposal wells will be completed at least 300 feet below the oil-water contact, established originally at 1236 feet subsea.

It appears that eight salt water disposal wells will ultimately be required. From studies completed on D-3 reef stratification, the most desirable position for the salt water wells will be approximately down through the field's center. Preliminary investigation into the design of a salt water system indicates a main line, six to eight inches in diameter, will be necessary. Trunk lines of three to four inches will likely be used to connect the various production batteries into the main artery.

To recover the maximum amount of oil from Redwater pool and sustain relatively high individual well producing rates, a pressure maintenance program early in 1953 will probably be necessary. The reservoir is believed ideal for pressure maintenance by means of water injection, and a ready source is available from the North Saskatchewan River flowing through the southern portion of the field. Theoretically, permeabilities and porosities are such that the injected fresh water could be placed into the water-bearing section of the reef without pressure at the surface, eliminating the need for pumps, except those required to lift the water from the river and pass it through the lines to the injection wells.

It has been suggested that operators examine the feasibility of restoring the bottom hole pressure back to virgin pressure or greater. The possibility of carrying out such a program is unique, and it could be attractive. The plan would require considerably larger quantities of fresh water than a pressure maintenance project and a greater capital expenditure. The additional cost might be more than offset by savings realized by eliminating a large percentage of individual well pumping costs. Such a program is under investigation by the operators.

About the Author

R. D. KNOWLES received his early education in Okotoks, Alberta, Canada. Prior to graduating from the University of Oklahoma in January, 1948, with a B.S. degree in petroleum engineering, he served four years in the RCNVR. The author was employed by Imperial Oil, Limited, in 1948, and has served in various engineering capacities in the organization. At present, he is in charge of Imperial's Reservoir Engineering section in Calgary, Alberta.

TABLE 2

Redwater Pool—Production and Pressure Data

	Total Wells Completed	Production Rate Barrels Per Day	Monthly Production Barrels	Cumulative Production Barrels	Reservoir Pressure End of Month Psig. @ 1165′
					Original–1050
October, 1948	1	283	8,772	8,772	....
November	1	371	11,137	19,909	....
December	2	547	16,965	36,874	....
January, 1949	7	2,208	68,448	105,320	1049
February	12	6,581	184,253	289,573	....
March	19	9,702	300,770	590,343	1043
April	41	11,451	343,540	933,883	....
May	70	10,168	315,215	1,249,098	1033
June	100	10,787	323,618	1,572,716	....
July	126	12,797	396,714	1,969,430	1024
August	158	17,740	549,947	2,519,377	....
September	198	21,099	632,978	3,152,355	1013
October	240	21,368	662,413	3,814,768	....
November	274	21,053	631,590	4,446,358	1006
December	296	12,388	384,007	4,830,366	....
Januray, 1950	313	14,483	448,978	5,279,344	1007
February	334	19,564	547,783	5,827,127	1005
March	366	28,132	872,088	6,699,215	....
April	408	21,560	646,797	7,346,012	994
May	448	20,475	634,722	7,980,734	....
June	521	26,145	784,362	8,765,095	981
July	573	28,383	879,863	9,644,958	....
August	619	26,597	824,516	10,469,475	....
September	654	36,593	1,097,773	11,567,248	....
October	691	43,828	1,358,662	12,925,910	....
November	725	50,573	1,517,207	14,443,114	(Nov. 15) 951
December	753	36,572	1,133,724	15,576,838	....
January, 1951	780	44,980	1,394,380	16,971,218	934
February	806	44,684	1,251,165	18,222,383	....
March	825	32,087	994,687	19,217,070	....
April	836	34,132	1,023,970	20,241,040	....
May	853	77,262	2,395,116	22,636,156	....
June	869	83,575	2,507,263	25,143,419	....
July	884	86,308	2,675,558	27,818,977	....
August	893	92,131	2,856,051	30,675,028	841

KINGDOMS OF OIL

No. 9

—Ranson of Edmonton

Aerial view of Edmonton (north side) with Macdonald Hotel in foreground, and the main business sector at center.

EDMONTON, CANADA

By BOB SHIELS
Oil Editor, *The Edmonton Journal*

WITH oil fields on all sides and new discoveries being developed at a record pace, the "Gateway to the North" and "Crossroads of the World," Alberta's capital of Edmonton, is headquarters for many of the oil companies whose combined exploratory efforts have found tremendous oil caches beneath Canadian farm lands.

Prior to February 13, 1947, Edmonton was developing with normal progress built around its wheat lands, coal mining districts, packing plants, lumber mills and other industries born of necessity on any frontier. Distributing center for a large agricultural territory, Edmonton, with its strategic location on the Great Circle route to the orient, has long been an air transportation center.

But a report that came to the city that cold February day, more than four years ago set off an unparalleled wave of excitement and industrial expansion. Word was flashed that a crew of shivering and weary oil workers, drilling a wildcat on snow-packed farmland near Leduc, 25 miles to the south, had met with undreamed-of success.

Imperial Oil Limited, after 114 unsuccessful efforts in north-central Alberta on the trail of oil which geologists said must be present below the province's yellow wheat fields, had found its answer—and that answer was the beginning of Alberta's oil boom, which shows no sign of easing off.

Leduc was followed by Redwater, then Golden Spike, Excelsior, Joseph Lake and Acheson. Tiny towns which previously were only whistle-stops or refueling centers for Alberta's railways, burst into prominence overnight. And Edmonton was smack in the middle of it all.

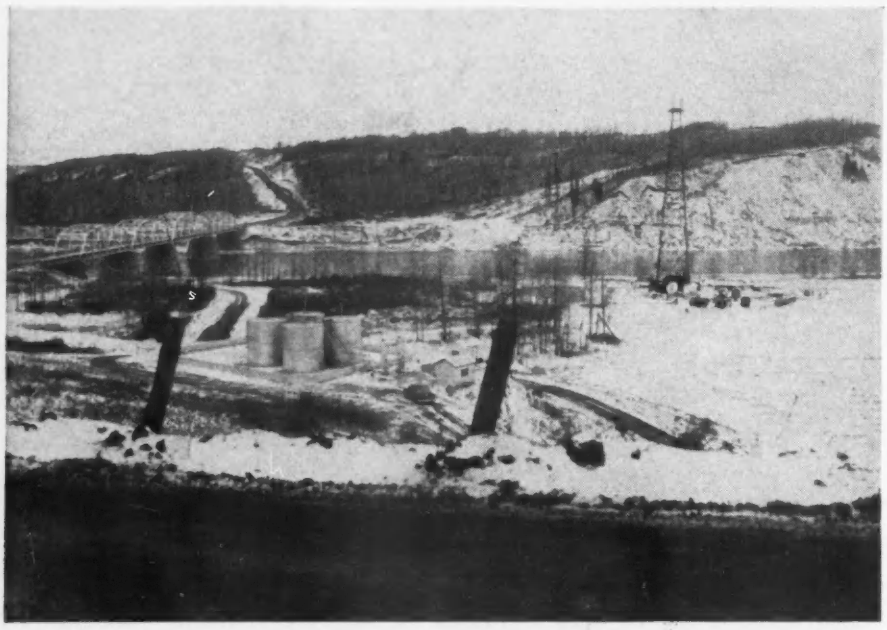
Oil companies began their migration to Edmonton, and within a few months, citizens who had thought of a "wildcat" as a prairie lynx were talking in boom town jargon. Today, about 60 oil companies are listed in the Edmonton telephone directory.

With the initial wave of excitement at an end, Edmontonians are becoming more blase about their oil. Construction of a major pipe line in 1948 rated headline coverage in the city's newspapers. In October, 1951, at least two major pipe line links were under construction, but news of their progress brought only "inside" stories in the local paper.

The fastest-growing city in the Dominion during the ten-year period since 1941, Greater Edmonton's population is pegged at 172,112, an increase of more than 75 percent in a decade. More than two-thirds of this increase has come in the past five years.

From the air, Edmonton is a great, sprawling giant; at some points, city limits are seven miles from the city's center.

Most visitors to Edmonton approach the provincial capital from the south, traveling the Calgary-Edmonton highway along the edge of the Leduc and Ellerslie oil fields. Entering the city, they drive through an area thickly-packed with the offices of oil firms and oil field servicing companies. This sector, newly-de-



Point where the North Saskatchewan River cuts through the Leduc-Woodbend producing area.

veloped and still growing rapidly, contains the heaviest concentration of petroleum headquarters.

North and South Edmonton are separated by a deep and beautiful tree-lined valley, through the center of which the murky North Saskatchewan River pushes slowly eastward. The thinly-populated valley forms a natural park and holds the city's baseball park and four golf courses.

The business and industrial sector is on the north bank. Most department stores and office buildings stretch along Jasper Avenue, which, winding parallel to the river's fast-dropping bank, was the locale of Edmonton's first business district in the pioneer days.

Postwar expansion, resulting almost entirely from the oil boom, has cultivated many serious problems in Edmonton. The city has found it impossible to provide roads, sidewalks, curbing and sewage outlets at the rate with which new residential districts are opening. Citizens living in new districts raise a constant clamor at the city hall, then leave to park their cars two blocks from their homes and splash along streets that too often are turned into seas of mud by rain or a sudden spring thaw.

To find parking space in downtown Edmonton is difficult. The business sector cannot handle the thousands of cars which have appeared on city streets since the oil boom expansion.

In an effort to solve the multiple problems of civic growth, the city has hired a town planner to repair the damage resulting from Edmonton's indiscriminate growth since it graduated from the rank of a fort—Fort Edmonton—in the days when the Hudson's Bay Company traded for furs and fought the Indians on the Canadian prairies.

As the "Gateway to the North," Edmonton is the supply and communications center for a vast, underdeveloped but potentially rich region stretching as far as the Arctic Ocean. The Peace River area, 250 miles northwest of Edmonton, long has been known as one of Canada's great farming sections, while the value of the country beyond the Northwest Territories boundary is gradually coming into its own.

The Northern Alberta Railway, serving hamlets and towns of northern Alberta, operates out of Edmonton. Most isolated sectors of the northland rely on the small charter airlines based at Edmonton's municipal airport. Oil development and exploration are beginning to invade the north, and Edmonton is the supply center. Edmonton, too, is "Mile Zero" on the Alaska highway.

The municipal airport, one of the finest in Canada, is Edmonton's major claim for the title "Crossroads of the World." Situated on the Great Circle route from Russia to New York, the airport services planes of all nationalities. An aircraft lands or takes off on the Edmonton airport runway on an average of every five minutes.

Alberta's capital is the intersection for a growing highway network. To the south is Calgary and a well-paved highway link. To the west is the much-traveled but less well-paved road to Jasper, one of the province's foremost mountain resorts. To the east is Saskatoon, Lloydminster and the big Lloydminster oil field. To the north is Peace River.

As the capital, Edmonton is the legislative and administrative center of the province. With oil revenue flowing in to fill the coffers of the provincial treasury, Alberta's administration has expanded, and the business of carrying on the affairs of the province has become one of Edmonton's major industries.

Material evidences of Edmonton's

Alberta and British American officials at the opening of British American's refinery. Left to right, seated, are G. W. Moyer, reeve of Municipal District of Strathcona, in which Edmonton's refineries are located; R. E. Kepke, B.A. vice president of supply and transportation; Hon. N. E. Tanner, Alberta minister of mines and minerals; W. K. Whiteford, B.A. president. Hon E. C. Manning, premier of Alberta, standing, is officially opening the plant.

For Pressure Reducing and Back Pressure Work You Can Depend On

NIXON

Selective Flow Differential

REGULATORS

— Quick Opening—Non-Throttling

— Freezing Held to Minimum

— Main Valve Does Not Cut Out When Handling Wet Gas, Sand, or Fluid

— Main Valve Ball and Seat Can Be Changed Quickly Without Removing Regulator From Line.

WILSON SUPPLY COMPANY

1412 Maury St. — Houston, Texas

BRANCH STORES

Texas—Alice, Corpus Christi, Victoria, Bay City, Columbus, Barbers Hill, Liberty, Beaumont, Kilgore, Monahans. Louisiana—Lake Charles, New Iberia, Houma, Harvey, Shreveport.

Sales Offices:

TULSA
DALLAS
NEW ORLEANS
SHREVEPORT

expansion may be seen on every side. Building permits issued at the city hall reflect the city's growth. Imperial Oil recently completed a modernistic four-story building housing the company's Production department. The province is building an administration building, a twin to the present edifice which has become hopelessly overcrowded by the required increase in civil staff.

Towering above the downtown area is a 13-story addition being built to the Macdonald Hotel, Edmonton's largest. About half completed, the addition dwarfs the present hotel with its towers and picturesque architecture.

Since 1947, Edmonton has developed into one of the largest oil refining centers in Western Canada. Imperial Oil has expanded its East Edmonton refinery to handle a capacity of about 30,000 barrels of oil daily. Two new refineries were completed in the summer and fall of 1951.

The British-American Oil Company placed its $8 million plant on stream late in July, with a capacity of 5500 barrels daily. A major event in the industrial development of Alberta, the refinery attracted hundreds of Edmontonians to official opening ceremonies.

In October, McColl-Frontenac Oil Company opened another Edmonton refinery. The McColl plant, with a capacity similar to British-American's boasts the largest fluid catalytic cracking unit in Alberta.

Canadian Celanese Corporation began work in 1951 on the largest industrial unit yet to come out of the oil boom. On a site immediately north of the Edmonton refining area, Canadian Celanese is constructing a $50 million chemical plant.

Interprovincial and Imperial pipe line companies maintain offices in Edmonton. At a pumping station a few miles east of Edmonton's city limits, crude from the Alberta oil fields begins the 1150-mile trip via the Interprovincial line to Superior, Wis.

Rear of grandstand, and part of crowd at Edmonton exhibition. The exhibition, Edmonton's largest annual show, is the city's counterpart to the Calgary Stampede, though less spectacular and well-known. There are always many oil exhibits at the Edmonton show.

Edmonton taxpayers are beginning to feel the effect of this expansion. All phases of civic administration have been faced with rapidly-increasing costs over the past five years. Cost of "running" the City of Edmonton during 1951 was estimated at $11,489,633, an increase of $1,780,000 over the previous year. But now there are more taxpayers in Edmonton to share the assessments.

Industrial and residential users of natural gas in Edmonton enjoy the lowest rates of any major Canadian city. Gas is piped by Northwestern Utilities, Limited, from Northwestern's Viking-Kinsella field, about 70 miles southeast of Edmonton.

Several times, Edmonton's city council has discussed drilling oil wells within the city limits. Despite the enthusiasm of councillors, such a project has never been undertaken. The University of Alberta, on Edmonton's southwestern outskirts, will drill a shallow test hole next year, but it will be used only for demonstration purposes.

Though the city itself has never tried to enter the oil business, drilling and producing of oil wells continues on every side. Commercial producers in the Ellerslie area have been drilled within two miles of the city's southern outskirts. The growing Acheson-Stony Plain sector is seven miles west, and the well-established Campbell field is nine miles north.

Edmonton has a tradition of being a warm-hearted and friendly city. Newcomers, the city boasts, seldom are strangers long—and there are many newcomers in these boom town days.

Sports, professional and amateur, receive wide enthusiasm. Best drawing cards are the home appearances of the Edmonton Eskimos football team and the Edmonton Fliers hockey team of the Western Football Conference and Pacific Coast Hockey League. Golf and tennis in the summer and skiing in the winter supplement the sports menu.

Activities are limited by a comparatively short summer. Edmonton is the most northerly of all major cities in North America and its winters are long and cold. Temperatures seldom reach extreme below-zero readings, but long sessions of sub-freezing readings are common through the winter months.

But cold or not, the oil boom continues at a steadily accelerating pace and the end is nowhere in sight. As long as the Alberta oil picture continues to brighten, Edmonton's prospects will glisten.

Canadian Oil Search Pushes North

THE EXPLORER's job in the Canadian Northwest is as hard as the muskeg is soft. But the big hunt for oil won't be halted even by weather and nature. Storied Peace River, formerly a distributing and administrative center owing its existence to the lure of gold that brought the early pioneers, may owe a more glorious future to the claims staked there by the oil industry.

THE search for oil and natural gas has spread into the Canadian Northwest, storied land of ice and wind and snow, blemished by muskeg and impenetrable forest but rich in the promise of mineral wealth.

Before World War II, Edmonton, capital of Alberta and the continent's northernmost city, was looked upon as being "away down north," and the town of Peace River, 250 miles northwest of Edmonton, was viewed as some sort of last outpost.

Today both centers are riding the crest of an unprecedented oil boom, and both are "jumping-off spots" for wildcatting oil outfits probing a vast territory extending to Norman Wells, 250 miles south of the Arctic Ocean.

Prospective territory for oil exploration north of Edmonton takes in the huge Mackenzie River Basin and extends from the Rocky Mountains on the west to the Canadian Shield on the east. Presence of oil and gas has been indicated since before the turn of the century, but it was not until Alberta's five-year-old oil boom began that serious attempts were made to tap the northern pools.

"There have been enough signs of oil and gas to indicate that the area should be fully explored," said a geologist for Imperial Oil Limited, Canada's foremost oil corporation and a subsidiary of Standard Oil Company (N. J.).

"The sedimentary basin is there," he said, "and it's just a matter of keeping on looking. It's a hot area, but it's a tough area to work in. Transportation and supply are the main problems."

Wartime strategic requirements, plus early success met by a few of the first companies to test the northern regions, has encouraged Canadian oil industry to sink millions of dollars into the exploration of the north.

Early in October, 21 rigs were engaged on wildcat sites in the Peace River area of northwest Alberta and northeast British Columbia, and nu-

Airplanes, employed for emergency transportation of personnel and equipment as well as other utility purposes, are being used more and more as survey parties push farther into the northern bush country. This float-equipped plane, shown tied up on the bank of the Peace River, is a type frequently used.

River boats such as these tied up at a landing on the Peace River are used to haul some of the heavier equipment to remote back country areas where exploration operations are taking place.

Pack horses are used to carry portable seismograph and camping equipment into the northern country when thawed ground prohibits use of wheeled or track-type vehicles.

merous other locations had been staked. More than 30 geophysical units were working in that sector. Other outfits had penetrated deep into the Northwest Territories.

The history of oil development in Canada's north goes back to 1920 when Imperial Oil began its producing and refining project at Norman Wells, about 90 miles south of the Arctic circle, a few miles west of Great Slave Lake.

Explorers had reported oil seeps in the area as early as 1875, and Imperial's first well, 50 miles northwest of Fort Norman, found oil in commercial quantities. Three additional wells were drilled, and a large productive area was indicated.

The Imperial refinery at Norman Wells went into operation in 1940, with a daily capacity of 840 barrels of crude. The capacity by 1943 had been increased to 1100 barrels daily, with refined products being used for local needs which included mining camp requirements at Port Radium and Yellowknife.

During World War II, the U. S. War Department, in cooperation with the Canadian Department of National Defense, undertook the noted Canol project. Sixty-seven wells were drilled at Norman Wells, of which 60 found commercial oil production.

An oil pipe line and highway link was built between Norman Wells and Whitehorse, in the Yukon. Engineers charged with the roadbuilding project had to contend with glacial ice and mountain streams. In their successful attempt to cut an artery through the northern wilderness, they faced problems far greater than those surmounted in building the Alaska highway.

For about two years, the pipe line, with a capacity flow of 800,000 barrels of oil annually, met the emergency military requirements for aviation gasoline, motor gasoline and light diesel fuel. The Canol project was discontinued in March, 1945, and the pipe line was shut down.

Seasonal Operation

Today, the Norman Wells refinery is operated on a seasonal basis. Oil is produced and refined during the annual "short summer," and a skeleton staff is maintained during the "long winter." During May, June and part of July, the sun shines 24 hours daily at Norman Wells.

Operation of the plant depends upon requirements in the Northwest Territories. During the peak season, a staff of about 75 is employed at the site.

Norman Wells embraces 25 producing oil wells, plus an additional 35 wells now shut in or protectively plugged. Depths ranged from 1492 to 2210 feet. Production during 1950 included 230,000 barrels of crude and 89 mmcf of gas.

After the war, with major oil fields discovered in the Edmonton area of central Alberta, oil companies began to press their search for new reserves into the northern regions between Edmonton and Norman Wells.

Good natural gas discoveries were made in the Peace River area. One of the leaders in the gas search was Pacific Petroleums Ltd., which, with its associated companies, is supporting Northwest Transmission Company in its current application for a permit to export gas by pipe line from Peace River area wells through British Columbia to the Pacific Northwest.

Hudson's Bay Oil and Gas Company hit the headlines of newspapers throughout Canada when its North Tangent 1 wildcat in the Peace River area blew in out of control. North tangent flowed gas at the rate of 50 mmcf daily for about six months before the flow was chocked off.

Imperial had the first crude discovery at Peace River. Imperial-Normandville 1, the discovery, now is on commercial production in the heart of rich farming territory about 30 miles south of Peace River town.

Late in 1951, the oil industry had moved out of the fast-developing Peace River area to extend its exploratory efforts into the soggy muskeg and tangled forest growth of Alberta's northern reaches and the Northwest Territories.

The muskeg denies geophysical and wildcat drilling crews the use of normal methods of transportation. Specially designed equipment and even horses are used to pack equipment north, and in numerous instances aircraft keep the seismic and drilling crews supplied. Charter airline companies, with the oil industry their chief source of revenue, are prospering and expanding.

Geophysical phase of the northwestern oil and gas hunt has seen many new techniques brought into play in efforts to meet the problems of muskeg, forests and seasonal cold.

The muskeg creates a problem unique to the Canadian north. It is found in low-lying areas and on the summit of low, rolling hills. The land is uneven and covered with moss, grass and, in some areas, trees. The soil usually contains a good deal of peat. It is unconsolidated and soft.

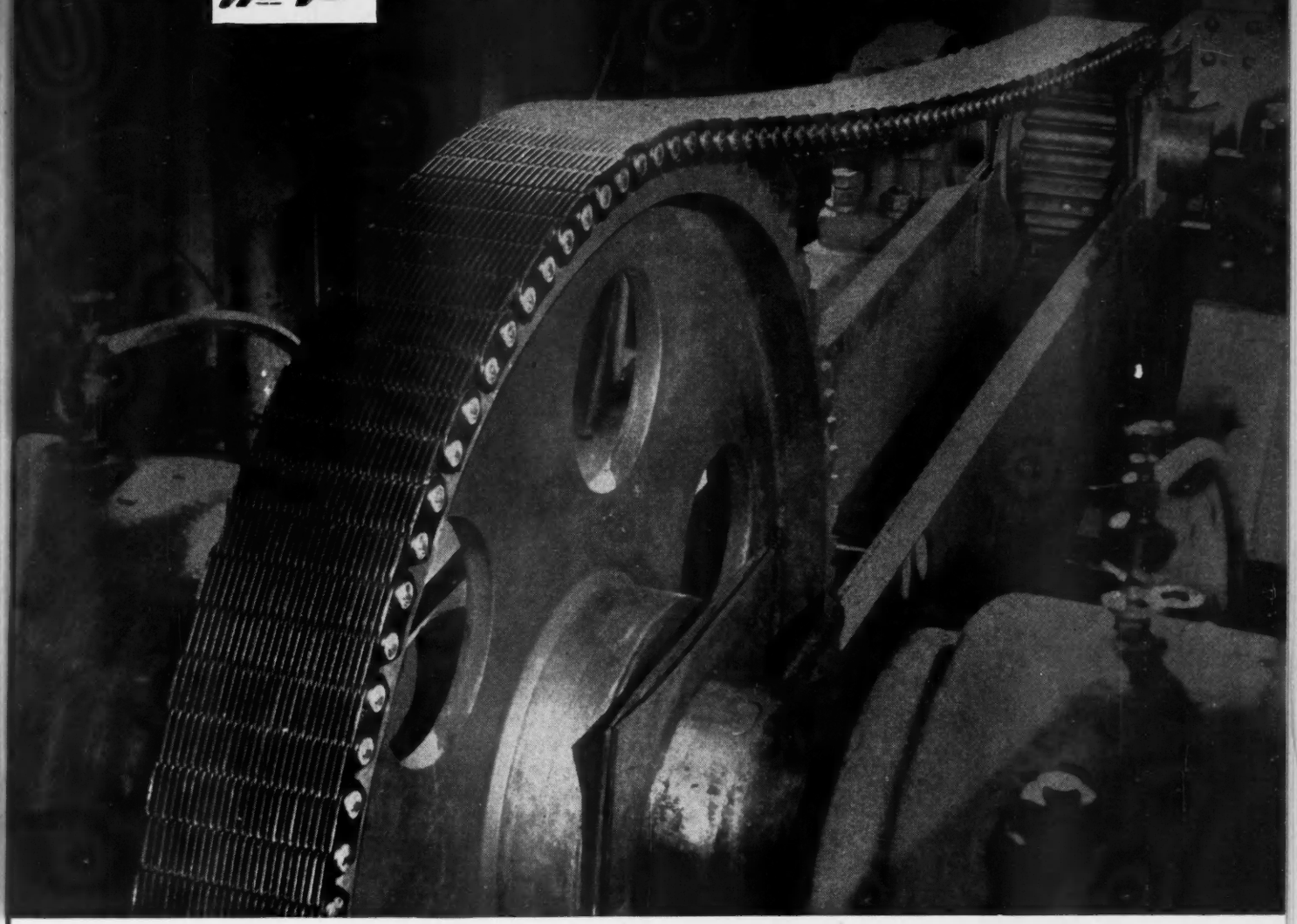
A muskeg odor of peat and moss is characteristic of the area. The roots of trees form tangled networks beneath the surface, and the trees themselves are seldom upright, forming interlocking barriers through which it is difficult or impossible to move heavy equipment. A person may shake a tree, and another tree 100 yards away will tremble in response.

Geophysical equipment is broken down into 50-pound packs, and a pack train is formed to penetrate the wilderness. Equipment ranging from technical instruments to cook stoves is flown in by plane.

When the ground is frozen over in

Aerial view of the town of Peace River, situated on the Peace river in northern Alberta.

Morse HY-VO Drive for a new age in power transmission



Morse Hy-Vo does 50% more work with 50% less chain

A *200-kilowatt* generator on the Standard Dredging Company dredge boat "Diesel" requires a 12"-wide silent chain drive.

When an additional generator was needed, the boat owners turned to Morse Hy-Vo (above). Result? The new *300-kilowatt* generator is driven by a 6"-wide Hy-Vo Drive. That's 50% more work with 50% less chain—and another application that Hy-Vo takes right in stride.

The Morse Hy-Vo Drive gives up to one-third longer service life, cuts operating costs per hour up to 50%. Morse Hy-Vo transmits more horsepower at greater speed (up to 5000 HP at 1200 RPM) and lower cost than any other standard drive.

New age in power transmission

Hy-Vo permits the transmission of vastly increased horsepower from smaller, less expensive, high-speed engines and motors—without costly accessories. Hy-Vo is the latest addition to a complete line of products that has made the name Morse a byword for the best in power transmission equipment and engineering.

Write today for Hy-Vo Catalog C 72-51 —or for information on Morse Silent Chain or Roller Chain Drives, Morse Flexible Couplings, Morse Drive Shafts, or Morse Clutches. (Hy-Vo orders must carry priority rating at present time.)

Branch offices serving the petroleum industry: 1312 LaBranch Avenue, P.O. Box 896, Houston, Texas; 1571 Harding Avenue, Pasadena, Calif.; 503 Martin Bldg., Pittsburgh, Pa.

More than ever, M=PT—Morse means Power Transmission.

MORSE
MECHANICAL POWER TRANSMISSION PRODUCTS
PRODUCTS OF BW BORG-WARNER

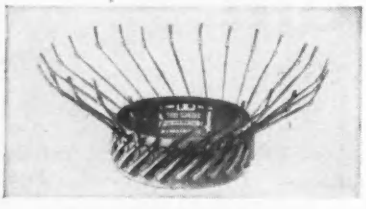
MORSE CHAIN COMPANY • Dept. 253 • 7601 Central Ave. • Detroit 10, Mich.

B and W
SCRATCHERS
AND
CENTRALIZERS
FOR
A GOOD CEMENT JOB

B and W LATCH-ON CENTRALIZERS

with the NEW
KON-KAVE BOW

and
B and W Multi-Flex Scratchers



are a GOOD Combination for a GOOD CEMENT JOB!

B and W Incorporated
• Well Completion Specialists •
WEST COAST — 3545 Cedar Avenue
Long Beach 7, California, Long Beach 4-8366
GULF COAST — P. O. Box 5266
Houston 12, Texas, Phone: WEntworth 6603

winter, sleds are used to bring in supplies. Bulldozers cut out roads which vanish when the spring thaw softens the earth. Horses sink in the muskeg. Mosquitoes and gnats attack the oil crews.

These conditions do not prevail in all parts of the north. The Peace River area, outside the muskeg region, is the best farming area in Canada, and successful settlements have been established at scattered points throughout the territory far north of Peace River town.

However, to fully evaluate the land, oil workers have had to take the good with the bad. They may find themselves in a region where the muskeg is up to 60 feet deep, or in a territory where rolling hills and blue rivers create a scenic pattern ranking with the beauty spots of the world.

Indians are hired by most seismic crews working in the north. They know the country well, and their help often is indispensable to outfits entering the region for the first time.

The Peace River area is one of the few sectors of Alberta in which gas rather than oil has spurred widespread development efforts. The lowest passes in the Rocky Mountains are west of Dawson Creek and Grande Prairie, towns in the Peace River region, and it would be a comparatively easy matter to build a gas pipe line through these passes to the west coast should export be authorized by the Alberta government.

"There are excellent prospects that gas or oil or both will be found in marketable quantities," a provincial government spokesman said recently. "Promising new formations have been opened up, including the Triassic, Permo-Pennsylvanian and Basal Gething. Production from these formations is limited to the northwest area."

The Alberta government issued a new set of regulations designed to encourage the industry to search for gas. In areas where gas has been found, the government will give exclusive gas rights as separate from oil rights. These rights are more favorable than for oil alone.

By October of this year, about 75 exploratory wells had been completed in northern Alberta. About 20 wells had been shut in as potential gas producers, two were on oil production and the remainder were abandoned.

The large proportior of abandonments indicates industry's willingness to take a chance in northern development program.

Technicians of all companies engaged in the northwestern play are at work today on the multiple problems of exploration and development north of Edmonton and Peace River.

New lightweight, muskeg area drilling rigs have been designed, with the emphasis on portability. Often they prove too light to carry the hole down to indicated productive formations, however.

Field geologists face the problem of glacial drift—powdered and mashed rock, a hangover from the Ice Age. The drift forms a cloak over natural rock formations, and makes the work of the geologist more difficult. Most field men must work in valleys and canyons and up streams, seeking outcroppings of rock. Their conclusions must be formed from bits and pieces of evidence rather than the whole picture.

In some regions, the surface soil covers gravel beds of 500- to 600-foot thickness. It is almost impossible to get satisfactory seismic results in some of these sectors.

The oil hunt, nevertheless, has proven a tremendous blessing for the inhabitants of the Northwest. New roads have been cut through regions which previously had none, and surveys have been carried out in previously uncharted sections. The town of Peace River, in particular, has benefited.

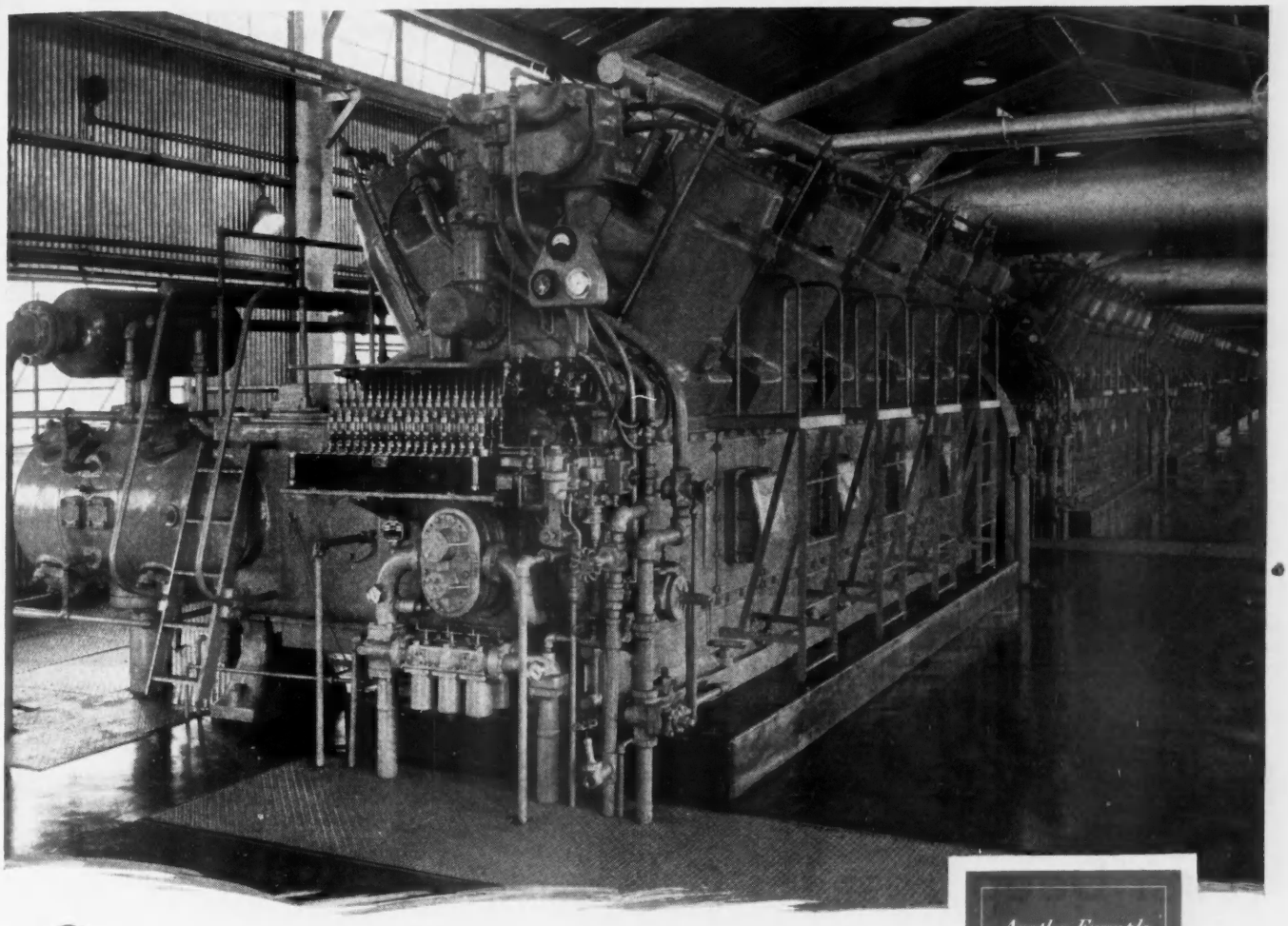
Although Peace River is a distributing and administrative center for an essentially agricultural area, it was the lure and promise of gold that gave the early pioneers the hope with which to endure the hardships of early settlement.

Early attempts at oil production failed, and pioneer settlers turned to agriculture. From 1918 to 1949, Peace River district was among the leading grain-producing areas of the world. The towns of the north were ranked by the number of grain elevators of which they could boast and by the number of world championships won by locally-grown wheat and oats.

The real boom came in 1950 and 1951, when the oil industry staked its claim in the Peace River country. Vacant lots in the town became dotted with trailer offices; all available office space was rented; and housing became a problem.

Citizens of Peace River began to experience the symptoms of progress: high costs, high rentals, crowded shopping areas, and overcrowded recreation centers. But the Peace Riverites could also point to scores of new apartment houses, new schools, stores and warehouses, and miles of newly-surfaced highway.

Each day, as a drilling rig is towed down Main Street or a weary crew of mud-spattered seismic workers returns to town, Peace River is reminded that its oil boom has only just started.



Space savings add up big...

...in the Shell operated Elk City Plant!

Another Example of Efficient Power at Lower Cost

TAKE a look at the compact, clean-cut line of engine-driven compressors shown here — seven Cooper-Bessemer 10-cylinder GMV's. Not so long ago the rating of these units would have totaled 7,000 horsepower. But with today's *supercharged* GMV's, it adds up to 9,450 horsepower. Thus, 7 GMV's are now doing the work of 10 older-type units . . . *with no increase in speed* and in only 7-unit space. Think what this saves in installation cost, piping, housing, maintenance, supervision and other expense items!

What's more, supercharged GMV's, like these, also offer important new economies in fuel and lube oil consumption. Straight through it's a more *efficient* operation.

Here you have the reasons why Shell and so many other companies are taking advantage of the latest developments in Cooper-Bessemer V-Angle design. The emphasis is on *big savings*, combined with the smooth dependability long demonstrated by these modern V-Angle units.

The **Cooper-Bessemer** *Corporation*

MOUNT VERNON, OHIO — GROVE CITY, PENNA.

New York, N. Y. Washington, D. C. Bradford, Penna. Parkersburg, W. Va.
San Francisco, Calif. Houston, Dallas, Greggton, Pampa and Odessa, Texas Seattle, Wash. Tulsa, Okla. Shreveport, La.
St. Louis, Mo. Los Angeles, Calif. Chicago, Illinois Caracas, Venezuela

On this first exploratory test in Nigeria, West Africa, equipment capable of reaching a depth of more than 10,000 feet is being used. The well was spudded in at Owerri in the eastern part of the country. Here, the rotary clutch is engaged by Mrs. Humphries, wife of the technical manager at the Ihuo location.

Nigeria, West Africa, Has First Deep Test for Oil

The first deep well ever drilled for oil in Nigeria, West Africa, was recently spudded-in near Owerri, in the eastern part of the country. A drilling rig capable of reaching 10,000 feet is being used.

Surface seepages of oil have long indicated the possibility of oil deposits in Nigeria. Before the last war, Shell Oil Company and Anglo-Iranian Oil Company became interested in the area and were jointly granted a permit by the Nigerian government to explore for oil. Activities were suspended in 1940 because of the war, but the search was renewed in 1946 and extensive geological exploration, including seismic and gravity work, has been carried out over a wide area as a preliminary to the drilling of the first deep test.

A new company—The Shell-D'Arcy Petroleum Development Company of Nigeria, Limited—was formed in September, 1951, to conduct operations on behalf of the parent organizations. The program has already cost more than $4 million.

Some exploration work has been done in about three-quarters of the 60,000 square miles concession area.

A base camp has been established at Owerri, equipped with offices, living quarters, stores and electricity. Social and athletic facilities, including a modern club house, are provided. A playing field has been laid out and a club building is to be built. Water for the drilling operations is drawn from the 'Mba river, about four miles distant, through a three-inch line.

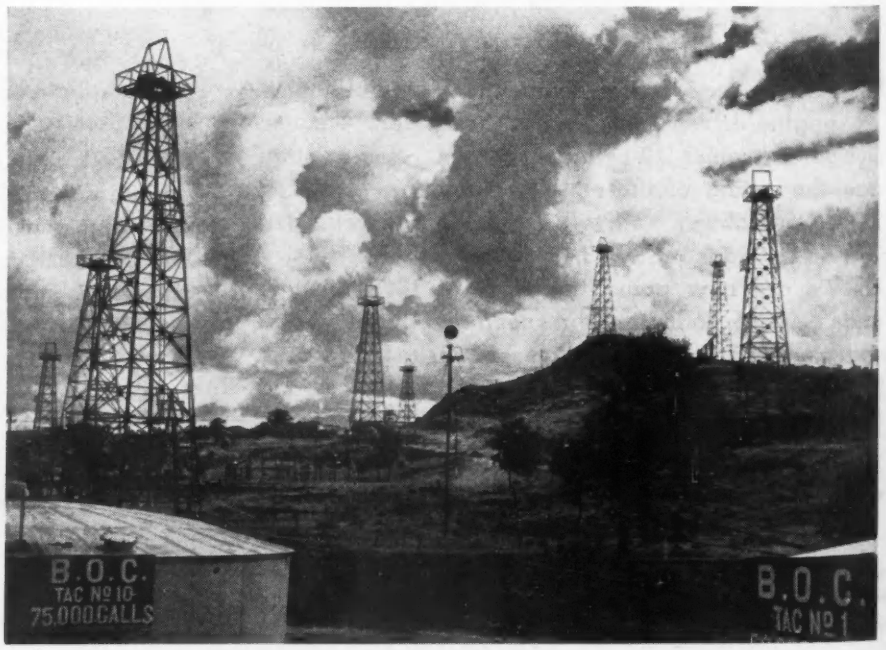
New Tests Scheduled for Central Burma Oil Fields

Several new wells were scheduled to be drilled in November at Chauk, in the Central Burma oil fields, the Burmah Oil Company (Burma Concessions) announced at Rangoon. A BOC geologist is supervising oil field operations for the program, which includes deepening of some existing wells.

All crude produced at Chauk in recent years has come from prewar wells in Burmah Oil's rehabilitated oil field. During the past few months, production from them has been approximately 2000 barrels daily, a record for the postwar period.

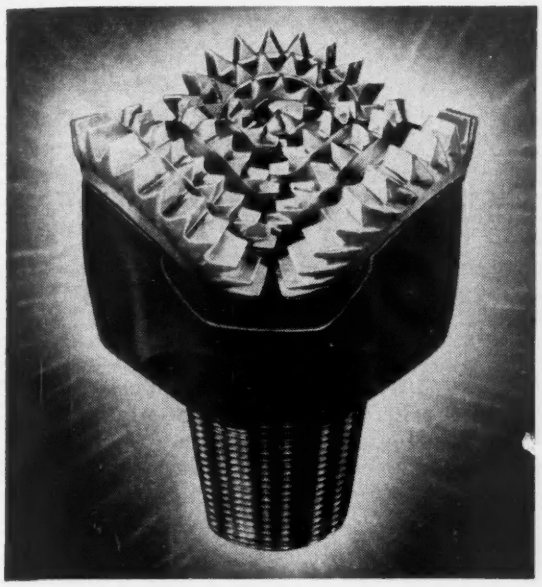
Current production is still running at the 2000-barrel-per-day level; however, the yield from present producing area is beginning to decline. New drilling and deepening operations are aimed at making up this decline and insuring a constant supply of crude to the company's refinery.

For several years, a limit has been imposed on production and refining of Burma crude by the amount of products that can be transported and distributed safely and economically. Postwar drilling was originally planned for 1948, at which time the war-damaged oil fields had been 90 percent rehabilitated and substantial parts of the pipe line to Syriam repaired; however, insurgent troubles which developed that year brought the pipe line repair project to a standstill.

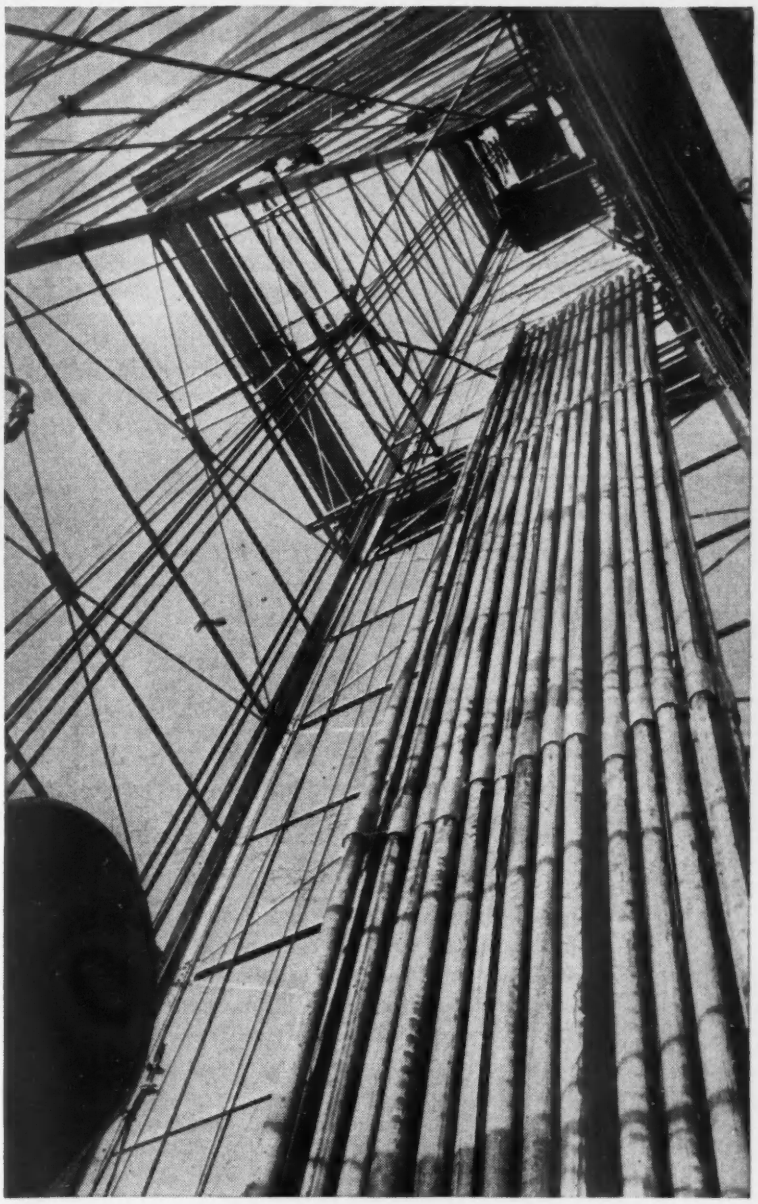


Monsoon clouds cast shadows over the Chauk oil field, whose first well was completed 50 years ago.

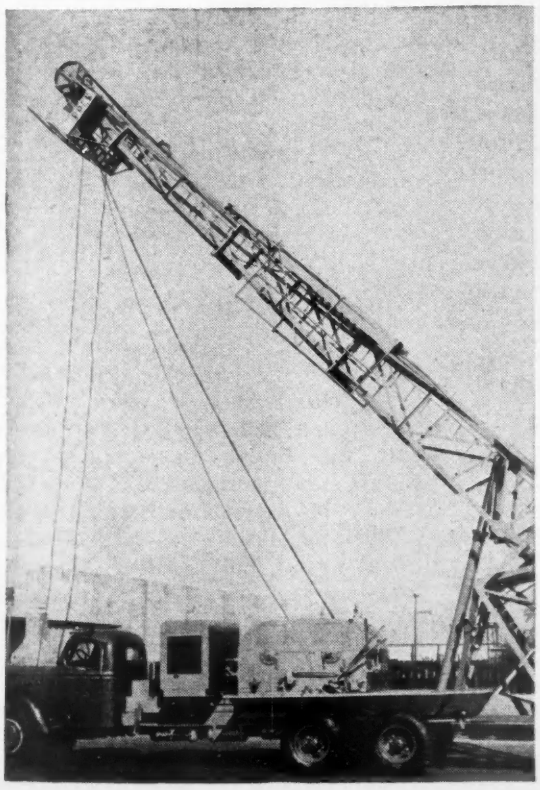
Only STEEL can do so many jobs so well



Going after buried treasure. This is a rock bit, the steel drilling tool that chews its way deep into the earth to tap buried treasures of oil and gas. For such bits, U·S·S Alloy Steels supply the super-strength, the high resistance to impact, shock, and abrasion needed for drilling to great depths.



Drilling 10,024 feet (3055.32m) in 38 days. This drill penetrated shale, limestone, rock and chert . . . dug an oil well 10,024 feet (3055.32m) deep in the amazing time of 38 days and 3 hours. Drilling equipment like this—as well as wire lines, pipe and cement—is made by United States Steel to serve the oil industry.



Folding drilling rig. Portable oil well derrick, made tough and light with U·S·S Cor-Ten Steel, unfolds from top of truck . . . is ready for the job in no time. An ingenious rig with a 50-ton (45.359 metric tons) capacity, it cleans out oil wells as deep as 5,000 feet (1524.00m).

UNITED STATES STEEL EXPORT COMPANY
30 CHURCH STREET, NEW YORK 8, U. S. A.

Saskatchewan Has Record Activity

The number of wildcats drilling in Saskatchewan climbed to a seasonal high of 19 for the week ending November 3 as three more wells were spudded in. At the same time, geophysical operations hit an all-time high of 44, with the addition of three crews during the week.

The three wildcats spudded in were Husky-Phillips La Porte 1 on land owned by the provincial government (SE16-29-26-25-W3rd) near La Porte, Husky-Phillips Eatonia B 1 on land owned by W. Humey (SW-2-4-27-24-W3rd) near Eatonia, and Royalite-Albercan Coleville 6-30 on land owned by A. M. Cole (SW-3-30-31-23-W3rd) near Coleville.

Two development wells spudded in at Lloydminster field were Albercan Franco Epping 2 and Husky G.C.D. Barlow 6, both near Lloydminster.

BORASCU* destroys weeds and grasses at a fractional cost of most methods such as hoeing, etc. You can enjoy substantial savings by using BORASCU* about *your* tank batteries, well sites, heater units, and rod lines, just as many other petroleum producers are now doing, for BORASCU* does destroy most vegetation and prevents future growth for 12 to 24 months, or longer, when correctly used! Borascu* and Concentrated Borascu are applied dry . . . if spray equipment is to be used, we suggest our new, improved Polybor-Chlorate for it is readily soluble and safe to use. Yes, it is nonfire-hazardous although it combines the plant-destroying powers of borates and chlorate . . . gives quick knockdown of tall standing vegetation. See these materials demonstrated on your property under your conditions without any obligation . . . act now!

**Reg. U.S. Pat. Off.*

Our Field Men and Distributors are located throughout the oil fields of U.S. and Canada; ask them for details or write direct to us for free literature.

BORASCU WEED KILLER

NONCORROSIVE* NONPOISONOUS NONFLAMMABLE NONSELECTIVE ECONOMICAL

*To Ferrous Metals

PACIFIC COAST BORAX CO.

DIVISION OF BORAX CONSOLIDATED, LIMITED

Weed Control Dept. Representatives located in: CHICAGO • NEW YORK CITY • NEW ORLEANS SEATTLE • PORTLAND, ORE. • CLEVELAND, OHIO • AUBURN, ALA. • KANSAS CITY, MISSOURI HOUSTON, TEX. • FT. WORTH, TEX. • AMARILLO, TEXAS • BOZEMAN, MONT. • MINNEAPOLIS, MINN. • SAN FRANCISCO • Home Office: 510 W. SIXTH STREET, LOS ANGELES 14, CALIFORNIA

Saskatchewan Test Fails To Find Commercial Yield

Oil of 33 gravity has been found at Shell-Dahinda 1, a wildcat near Dahinda, 55 miles south and west of Regina, Saskatchewan.

J. H. Brockelbank, Saskatchewan resources minister, described the find as the best light oil show in grade and quantity yet made in the province. Because the oil did not exist in commercial quantities, the well is expected to be abandoned. Dahinda 1 was spudded in early in July, and at latest reports had reached a depth of 6466 feet. Earlier, the well found 20-gravity oil at about 4600 feet. This strike, too, failed to result in commercial production prospects. Results of the drilling were delayed, pending announcement by Shell Oil Company.

Alaska Oil Field Confirmed

A Navy review of recent exploration in Alaska has confirmed existence of an oil field at Umiat on the Colville river and of natural gas within the Naval Petroleum Reserve No. 4 (Alaska). The committee, appointed to advise the Secretary of the Navy on the Navy's Alaskan oil program has also confirmed the presence of many untested prospects, and concluded a recent meeting at Denver with a recommendation for further exploration of Alaska in 1952 and 1953.

Wildcat Strikes New Pay

Deutsche Erdoel-AG extension well Hohne 6 struck a new deposit at 6133 feet in Hohne field. Previous wells in the Hohne field produced oil from only the Alpha sandstone of the Liassic, and this latest discovery proves the subsequent Rhaetic to be oil bearing. Production tests resulted in an initial daily flow of approximately 140 barrels. Discovery of the new oil horizon is of significance to the entire area between Wesendorf, Gifhorn, Hohne and Eldingen.

German Wildcat Below 4750

Deutsche Erdol-AG wildcat well Helmsand 1, the first deep offshore well in Northern Germany, was drilling below 4750 feet, where it reached the Upper Cretaceous. The wildcat was scheduled to be completed at 7545 feet.

ENGINEERED. . .FIELD PROVEN...

STANDARD Lufkin PRACTICE

SIDE MEMBERS

DURABILITY
Heavy pipe construction—continuously welded to give maximum strength and capacity. Jig welded for accuracy and interchangeability.

ALIGNMENT
Ball and socket crank pin connection giving automatic immediate alignment.

SIMPLICITY
Few parts—single bolt latch for disconnecting—smooth appearance.

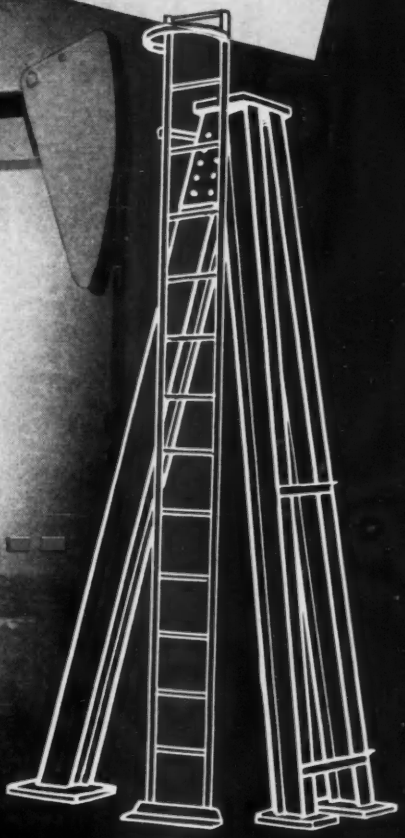
LUFKIN GIVES YOU the best in materials and design possible for our engineers to pack into each component part. Every part is made to be tough, so it will stand up under the toughest service—but easy to maintain. Note the features of these Lufkin assemblies which help to make Lufkin first in service, safety, dependability and efficiency.

SAMSON POSTS

FABRICATION
Jig welded to insure interchangeability.

STRENGTH
Designed for rigidity with considerable reserve load carrying capacity.

MATERIAL
The samson posts are made from wide flange beam sections.

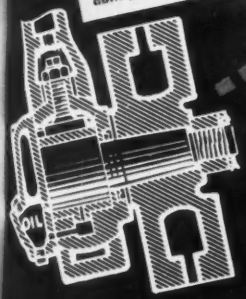


PITMAN BOX

CAPACITY
Bronze bushed with large bearing area to carry heavy loads.

TROUBLE FREE
Oil bath, dust proof construction with breather which allows moisture to escape. This eliminates oil contamination and costly repairs.

CRANK PIN FIT
The taper ground crank pin and the crank pin hole are checked with precision gages insuring a perfect fit and interchangeability.



BASES

MATERIAL
Bases are made from wide flange beam sections with stiffeners to give extra rigidity where the most weight is concentrated.

INSPECTION
Each base is template drilled and thoroughly inspected before it leaves the plant.

VARIETY
Bases are made to fit every type of prime mover and can be furnished with or without sub bases.

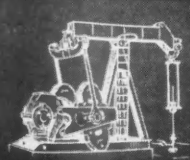
LUFKIN FOUNDRY & MACHINE COMPANY

LUFKIN, TEXAS

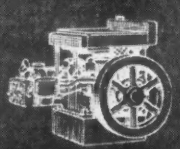
Branch sales and service Houston, Dallas, New York, Tulsa, Los Angeles, Seminole, Oklahoma City, Corpus Christi, Odessa, Kilgore, Wichita Falls, Casper, Wyoming; Great Bend, Kansas.

Lufkin Equipment in CANADA is handled by

THE LUFKIN MACHINE CO., LTD., 14321 108th Avenue, Edmonton, Alberta, Canada.



LUFKIN PUMPING UNITS



LUFKIN-COOPER-BESSEMER ENGINES

LUFKIN OIL FIELD AND INDUSTRIAL TRUCK TRAILERS

INDUSTRIAL SPEED REDUCERS AND INCREASERS

DIVISION LUFKIN FOUNDRY & MACHINE COMPANY INDUSTRIAL, MILL AND AUTOMOTIVE SUPPLIES

Germany's Crude Output Passes 800,000 Barrels

Almost 850,000 barrels of oil was produced by German oil fields during August, approximately 28,268 barrels more than the previous month. Suderbruch, a Hanover field, exceeded July's output by 6572 barrels and became the No. 1 field in the Hanover-Celle group. Eldingen field's production rose to 32,126 barrels during the month.

Production from Emsland fields, Ruehlermoor-Ruehlertwist, also increased. For the first time, monthly production of Ruehlermoor field was more than 445,221 barrels. Lingen production rose by about 4593 barrels, while Scheerhorn's output was 2120 barrels more than for the previous month.

20 German Wells Completed

Twenty wells were completed in the Western Zone of Germany during July, including the wildcat Frenswegen 1, which found a natural gas deposit. Total footage drilled during the month was 127,467, surpassing the June result by approximately 21,320 feet. Exploratory tests accounted for about 13,000 feet, and shallow core holes hiked the total 1971 feet.

SPACE NOW AVAILABLE

IN DOWNTOWN HOUSTON

Great Southern Building

Preston, Louisiana and Prairie Avenues

FOR LEASE

60,000 Sq. Ft. of office space on 4th, 5th, 6th, and 7th floors, now being used by Great Southern Life Insurance Company. Will be available March 1st, 1953.

Passenger and Freight Elevator Service and Steam Heat
Hot and Cold and Ice Water Furnished

15c PER SQUARE FOOT PER MONTH

Will lease one or more floors to tenant but will not subdivide floors.
All improvements and alterations to be at tenant's expense.

WILL AIR CONDITION

VARNER COMPANY, *Owner*
PRestон 1242

HAROLD JOHNSON, *Agent*
Houston, Texas

New Refinery Will Be Built At Iraq, Premier Announces

Premier Nuri es Said of Iraq has reported that a new 700,000-barrel capacity refinery would be constructed south of Basra, and would go on stream in late 1952. This move was necessitated by the shutdown of the Abadan refinery, which previously shipped oil products to Iraq. During his recent visit to London, the Iraqi premier obtained manufacturing equipment and pipe lines.

The premier said Iraq had already achieved "the object of nationalization," and added, "we are going to receive more oil royalties than neighboring countries are for their oil. A new accord reached between Iraq and the oil companies provided the country with 50 percent of profits." He said he was ready to ask for more royalties if Iran got more.

Baluchistan Exploratory Test Below 1000-Foot Level

Pakistan Petroleum, Ltd., test well at Sui, Dera Bugti, in Baluchistan is drilling below 1029 feet. The hole was lined at 439 feet with a 16-inch steel pipe to prevent caving, after which drilling was resumed in 14¾-inch hole. This conductor pipe also forms the anchor for blowout preventers.

Formations met so far have been soft sandstones. One drilling string twistoff occurred, but the lost piece of drill pipe was recovered quickly.

Pakistan Petroleum began drilling operations in the uninhabited sandy desert of Sui on October 10. This well will be drilled to a maximum of 10,000 feet if oil is not found.

Burma Premier Promises Orderly Nationalization

An orderly nationalization of Burmese oil industry has been promised by its premier, Thakin Nu. First step was the purchase of 5 percent of the $280 million outstanding shares in Burma Oil Company, Ltd., a British company, which also operates a refinery at Rangoon, Burma capital. Burma Oil owns stock in Anglo-Iranian Oil Company, whose vast Iranian holdings were expropriated last spring by the Iranian government.

Burma's nationalization of oil, however, will come through purchase only, the premier said. In 1950 Burma production reached 1000 barrels a day.

S & R MUD PIT

S & R Mud Pits are practically indestructible . . . with any reasonable care in loading and transporting, they will give years of service.

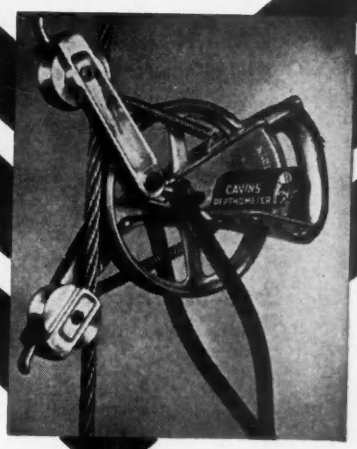
Standard pits are 6 feet deep, 30 feet long, 7′ 6″ wide and have a capacity of 234 barrels. Bottoms are ¼″ steel plate; sides of 3/16″ or ¼″ as specified. Heavy reinforcing . . . 3″ channel iron ribs on 36″ centers . . . provides utmost strength and rigidity along the sides. Top cross braces are above the mud level in the tank, so that the interior is absolutely free of obstructions. A clean-out plate is furnished at one end.

S & R Steel Mud Pits are skidded on 6″ H-Beams, with heavy cross-braces along the length. Skids are 8 feet wide and 33 feet long; the pits may be hauled on any standard oil field trailer. Beams are recessed at each end, so that the winch line may be snubbed or wrapped around the ends of the braces for speed, safety and convenience in loading and unloading.

Write for further information.

S & R TOOL & SUPPLY CO.
P. O. Box 1755 155 McCarty
HOUSTON 1, TEXAS
Export: 233 Broadway, New York 7, N. Y.

NOW YOU CAN EASILY TAKE ACCURATE WIRE LINE MEASUREMENTS



THE CAVINS DEPTHOMETER

will tell you where bottom is in little more time than it takes to make a trip with your bailer Gives you accurate depth in plain figures—compensates for raising and lowering tools when feeling for bottom. Strong, light-weight, easily used, and priced right Send today for illustrated folder.

THE CAVINS CO.

Reliable Performance On Refinery Service

ALLIS-CHALMERS Type SSB PUMPS

DESIGNED TO OIL COMPANY SPECIFICATIONS, Allis-Chalmers SSB pumps are built to handle non-corrosive or corrosive lube oils, gas oils and light hydrocarbons up to 250° F. Into their design and construction go years of experience of skilled Allis-Chalmers pump specialists. The result is a pump with longer life, greater efficiency and greater economy: a pump that is carefully designed for the job it must do — protected against excessive wear and corrosion.

Design Features

- **Extra long stuffing box with 7 rings of packing reduces leakage. (Water cooled stuffing box is optional.)**
- **Ring oil ball bearings assure constant lubrication without foaming.**
- **Water cooled bearings for increased bearing life optional.**
- **Smothering type bronze bushed glands or mechanical seals optional.**
- **Liquid end of pump is a self contained unit and can be supplied in a complete range of materials — stainless steel, chrome steel, Ni-Resist, monel metal, nickel, bronze, steel or cast iron.**
- **Wide range of sizes to handle from 10 to 3000 gpm.**

Write *TODAY* for complete information.

CANADIAN ALLIS-CHALMERS (1951) LIMITED
P.O. BOX 37, MONTREAL, QUEBEC

MADE IN CANADA 51-CAL-17

CANADIAN ALLIS-CHALMERS

Potential Tests Scheduled For New Sector Producer

Opening up a promising new sector for petroleum development, British-American-Cities Service-Clive 1, a discovery oil well in the Clive sector of south central Alberta, has gone on production from the D-2 zone of Devonian.

The well was drilled on a 50-50 partnership basis by the British-American Oil Company, Ltd., Canada's largest independent oil company, and Cities Service Petroleums of Oklahoma, U. S. producer, refiner and marketer.

Clive 1 is about 75 miles south of Edmonton, and 20 miles southwest of American-Leduc-Bashaw 1, a Devonian discovery oil well brought in this year by American-Leduc Oil Company, Ltd., an Edmonton independent.

The well was drilled to a completion depth of 6421 feet as a test of the D-3 Devonian-age formation, but the D-3 proved water-loaded. Plugged back to the D-2, the Clive venture was acidized with 500 gallons in the interval 6211-30 feet. Potential tests were being run. Oil is of 38.5 gravity.

Clive 1 found oil in virgin territory 12 miles from the nearest producer. British-American and Cities Service hold about 1000 acres of checkerboard leases in the area, and a half-dozen other Canadian and American interests have reservations in the same sector. The B. A.-Cities Service team now plans to diamond core a second venture to evaluate fully the D-2 pay zone.

ASK THE ROYAL ABOUT CANADA'S OIL
Branches throughout Canada's oil-rich western plains. On-the-spot information available through J. C. Mayne, Supervisor, Calgary, Alberta, or Head Office, Montreal
We do not provide information on oil securities
Assets exceed $2,497,000,000
THE ROYAL BANK OF CANADA
Over 750 branches in Canada and abroad

Possible Oil-Bearing Area On Vancouver Isle Is Hinted

George Prudham, minister of mines for the Canadian government, has hinted that an extensive oil bearing area may have been discovered on the west coast of Vancouver Island.

A release from Prudham's department said geological surveys this year have disclosed areas of marine Tertiary strata of the same type and age as in other oil-producing areas on the southern part of the Pacific Coast of this continent.

"The sediments occur on the flank of an indicated basin," the announcement said. Discovered between Kyuquot and Clayoquot Sounds, they were particularly well developed near Nootka Sound, on Hesquiat Peninsula.

Earlier, similar strata were found on the southwest coast of Vancouver Island south of Barkley Sound. According to the latest announcement, "the earlier findings formerly were not considered especially important in relation to possible oil occurrences."

Discovery of the strata is indicated as shedding new light on the earlier finds. The sedimentary strata at Kyuquot-Clayoquot are described as shales, sandstones and conglomerates, tilted to the west at moderate dips and apparently somewhat faulted. This information points up the possibility that the indicated Vancouver Island basin is, like the California basin, largely under water.

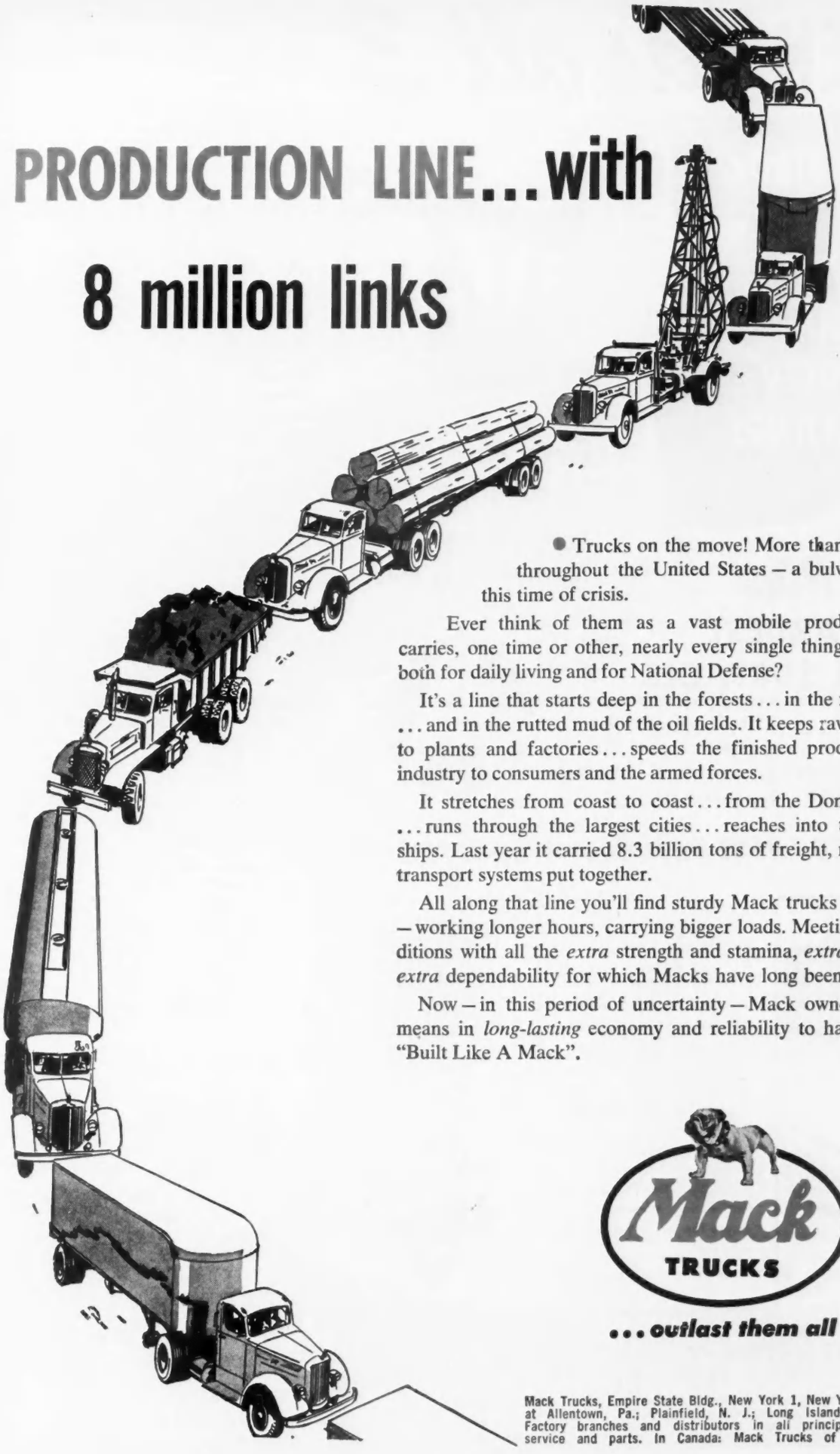
Netherlands Wildcat Drilling

Nederlandse Aardolie Mij. is drilling a wildcat near Meppel, about 25 miles west of Coevorden, Netherlands. Exploration wells are usually drilled in the area of Giethoorn, Wanneperveen and Kolderveen.

Chile Production Tabulated

Empresa Nacional de Petroleo, Chile's national petroleum monopoly, produced 374,407 barrels of crude during the first half of the year, and exports, shipped exclusively for refining in Uruguay, totaled 372,543 barrels.

PRODUCTION LINE...with 8 million links



● Trucks on the move! More than 8 million of them throughout the United States – a bulwark of security in this time of crisis.

Ever think of them as a vast mobile production line which carries, one time or other, nearly every single thing we need and use, both for daily living and for National Defense?

It's a line that starts deep in the forests... in the mines and quarries ... and in the rutted mud of the oil fields. It keeps raw materials flowing to plants and factories... speeds the finished products of American industry to consumers and the armed forces.

It stretches from coast to coast... from the Dominion to the Gulf ... runs through the largest cities... reaches into the smallest townships. Last year it carried 8.3 billion tons of freight, more than all other transport systems put together.

All along that line you'll find sturdy Mack trucks doing double duty – working longer hours, carrying bigger loads. Meeting emergency conditions with all the *extra* strength and stamina, *extra* performance and *extra* dependability for which Macks have long been famous.

Now – in this period of uncertainty – Mack owners realize what it means in *long-lasting* economy and reliability to have trucks that are "Built Like A Mack".

Mack TRUCKS

... outlast them all

Mack Trucks, Empire State Bldg., New York 1, New York. Factories at Allentown, Pa.; Plainfield, N. J.; Long Island City, N. Y. Factory branches and distributors in all principal cities for service and parts. In Canada: Mack Trucks of Canada, Ltd.

ALTEN *has all 3*

LONGEST STROKES

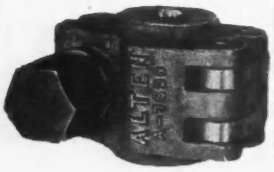
HIGHEST GEAR REDUCER RATINGS

Every Alten Pumping Unit will positively perform to its full rated capacity.

Plus **HARDEST GEAR SURFACES**

ALTEN

THE WORLDS BEST PETROLEUM EQUIPMENT

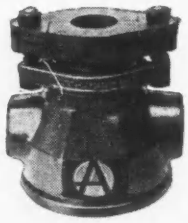


Polished Rod Clamp

Polished Rod

Whether your next equipment purchase is a giant pumping unit or a small polished rod clamp, ask for Alten at your supply store.

You'll get more for your money right from the start because Alten equipment is sensibly priced. You get more for your money through the years because Alten equipment has added engineering advantages to assure top performance and long life.



Stubby Tubing Head

Stop Cock

ALTENS FOUNDRY & MACHINE WORKS INC.

LANCASTER, OHIO

Soviets Exploring Fields In Eastern Austrian Area

The Soviet Mineral Oil Administration, monopoly directorate of the Soviet naphtha ministry for the eastern Austrian oil fields, has explored two new, smaller-sized oil fields, about 30 miles southeast of Vienna.

Test drilling by German firms, in cooperation with Eurogasco during World War II, hit only one gas deposit, which, after exploding, destroyed the nearby Enzersdorf 1 drilling area. However, the Soviets are said to have found a small but high-grade deposit. Drilling in their zone of military occupation, they are following patterns established by the former oil field owners, U. S., British, German, and Dutch companies.

"Counter-flash" drilling near Langenzersdorf and Schwadorf located new fields; however, no capacity has been announced yet. These new fields are the only ones discovered south of the Danube river. Two heavy rotary rigs are continuing the search.

Antwerp Refinery on Stream

The first major refinery in Antwerp, Belgium, with an annual throughput of more than 10 million barrels, went on stream at the end of September. It is owned by Societe Industrielle Belge des Petroles S.A., a joint 50-50 venture of Anglo-Iranian Oil Company and Petrofina. A new maritime dock was built recently by the Antwerp port authorities to accommodate simultaneously two 28,000-ton tankers. Barge berths for handling export of finished products by canal have also been provided. Most of the refinery products are destined for Benelux countries, and will also help meet ship bunkering requirements.

New Pay Found

Well 231, situated in the middle western part of the Emsland field of Georgsdorf, struck a new pay horizon in the Wealden at a depth of about 3100 feet. Previously, the Georgsdorf field, currently Germany's leading producing field, had only one oil horizon, the Valendis (Bentheim sandstone). Georgsdorf's monthly yield is about 70,000 barrels.

Oil Consumption Totaled

The Western Zone of Germany consumed 15,547,400 barrels of crude products during the first half of 1951.

Financing Development of Canadian Oil and Gas Resources

To arrange for the underwriting and distribution of oil, gas and pipe line securities and—

to assist investors in the selection of securities most suited to their individual requirements—

the facilities of our offices in Toronto and other principal Canadian cities as well as New York and London, England are always available.

Wood, Gundy & Company
Limited

Underwriters and Distributors of
Canadian Securities

Established 1905

Head Office: 36 King Street West, Toronto

Branch Offices in:—

Montreal New York Chicago London, Eng.
Winnipeg Regina Edmonton Calgary Vancouver
Ottawa Hamilton London, Ont. Kitchener
Halifax Quebec New Westminster Victoria

TOUGHER THAN EVER!

the New

BJ

PYRAMID TOOTH

tong die

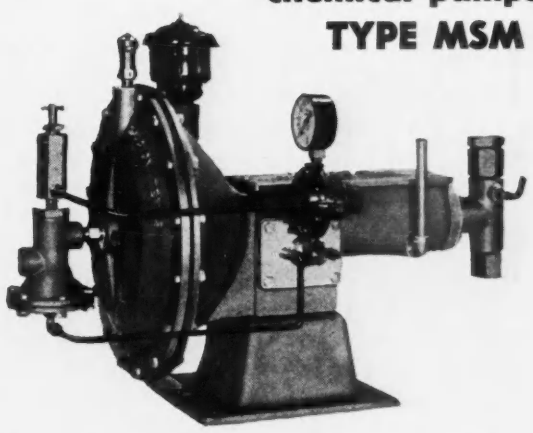
Grips like a die has never gripped before. Won't chip. Reversible.

ANOTHER BJ ENGINEERED PRODUCT

Byron Jackson Co.
Since 1872
MAIN OFFICE & PLANT: LOS ANGELES 54, CALIF.
Mid-Continent Office & Plant: Houston 1, Texas
Export Office: New York 17, New York
JOBBERS IN ALL PRINCIPAL OIL FIELDS

TEXSTEAM

for the finest in chemical pumps TYPE MSM



Injection pressures up to 20,000 psi, with volumes from ½ pint to 360 gallons per 24 hours! Here's the finest pump for handling chromates and other corrosion inhibitors under continuous, high pressure operation.

BETTIS CORPORATION

P. O. Box 9091 Houston 11, Texas

Of World Oil Men

F. C. SEALEY and E. M. Butterworth have been elected vice presidents of California Texas Oil Company, Ltd. Sealey has been associated with the oil industry during his entire business career, which began with The Texas Company in 1917 as assistant geologist. He has devoted the past 13 years to petroleum producing activities outside the U. S., and since July, 1949, he has been in charge of producing and exploration for the Caltex-Bahrein group of companies with headquarters in New York.

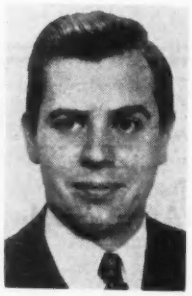
Butterworth, a geologist by training, began his oil career after graduation from the University of California in 1916. He was for a considerable period active in the Far East in the territories now comprising Indonesia dating from 1924. For the past several years, he has been directly concerned with government relations in Sumatra and New Guinea for the Caltex-Bahrein group.

F. C. Sealey

E. M. Butterworth

•

GEORGE R. WALKER, JR., has been named assistant treasurer of International Petroleum Company, Ltd. Previously, he has been a senior foreign exchange analyst with the Treasurers' department of Standard Oil Company (N. J.), International's parent.



George R. Walker, Jr.

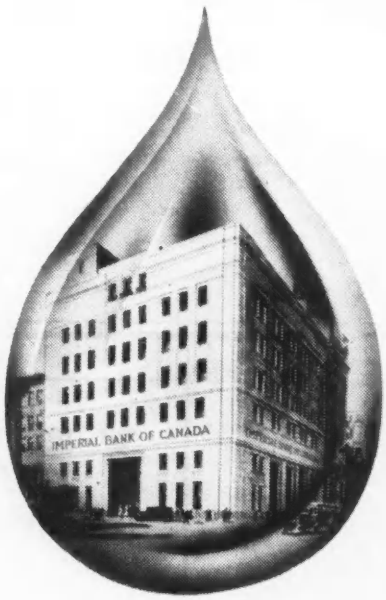
Walker was graduated from Yale University in 1944 with a major in economics, and following wartime service in the Navy, attended Harvard University Graduate School of Business Administration, receiving the degree of master of business administration in February, 1948.

•

HENRY P. BLACKEBY has been named chairman and Fred H. Billups, president, of the recently-formed Esso Standard Oil, S. A., which has replaced the former Esso Standard Oil (Central America) S.A. and acquired the business of the latter's five affiliates. Headquarters of the company is at Havana and principal offices are located in Cuba, Panama, Dominican Republic, Puerto Rico, and Trinidad.

Blackeby formerly was assistant comptroller of Standard Oil Company (N.J.), with headquarters in New York. Billups has been Western Hemisphere marketing advisor for Jersey Standard.

Your Partner in the OILFIELDS



Imperial Bank has pioneered banking service in those areas now making oil history. And it has a wide and long-established familiarity with local conditions.

The special knowledge of Imperial Bank's oil representative, Mr. A. S. de Rosenroll, manager of the main Branch in Calgary, is at your service. Imperial Bank has four Branches in Calgary, six in Edmonton, and over fifty throughout the Provinces of Alberta and Saskatchewan.

Managers of these Branches are eager to serve the Oil Industry's needs in very way possible.

Yours For Service

IMPERIAL BANK OF CANADA

Oil Field "Natural"

for Haulability and Versatility

A natural for the oil fields! That's the new Baker 9-X "No Push Beam" Bulldozer. Just load it on a regular highway-width trailer and ramble—no permits needed day or night—for it's only 96" wide—legal anywhere.

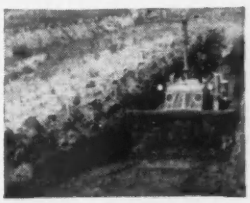
But it digs *BIG* because it is BIG-MOUNTED on the versatile Allis-Chalmers HD-9 Tractor—with 8 inches extra moldboard height to permit full loads.

Get the story of this revolutionary design in Bulldozers, developed and proved in cooperation with A-C engineers, from your Baker, Allis-Chalmers dealer, or write direct for Engineering Bulletin 896-B. THE BAKER MANUFACTURING COMPANY, Springfield, Illinois.

Performance? Here's What — and Why!

In and Out *FAST*—Simple, direct mounted design (see above) provides steeper angle of approach for "yard-saving" performance. Drops 13", raises 37".

Slush Pit "Natural"—9-X dug this 6 ft. deep, 50 ft. long slush pit in 80 minutes—81 passes. 11 foot approach down grade; up only 8 feet!

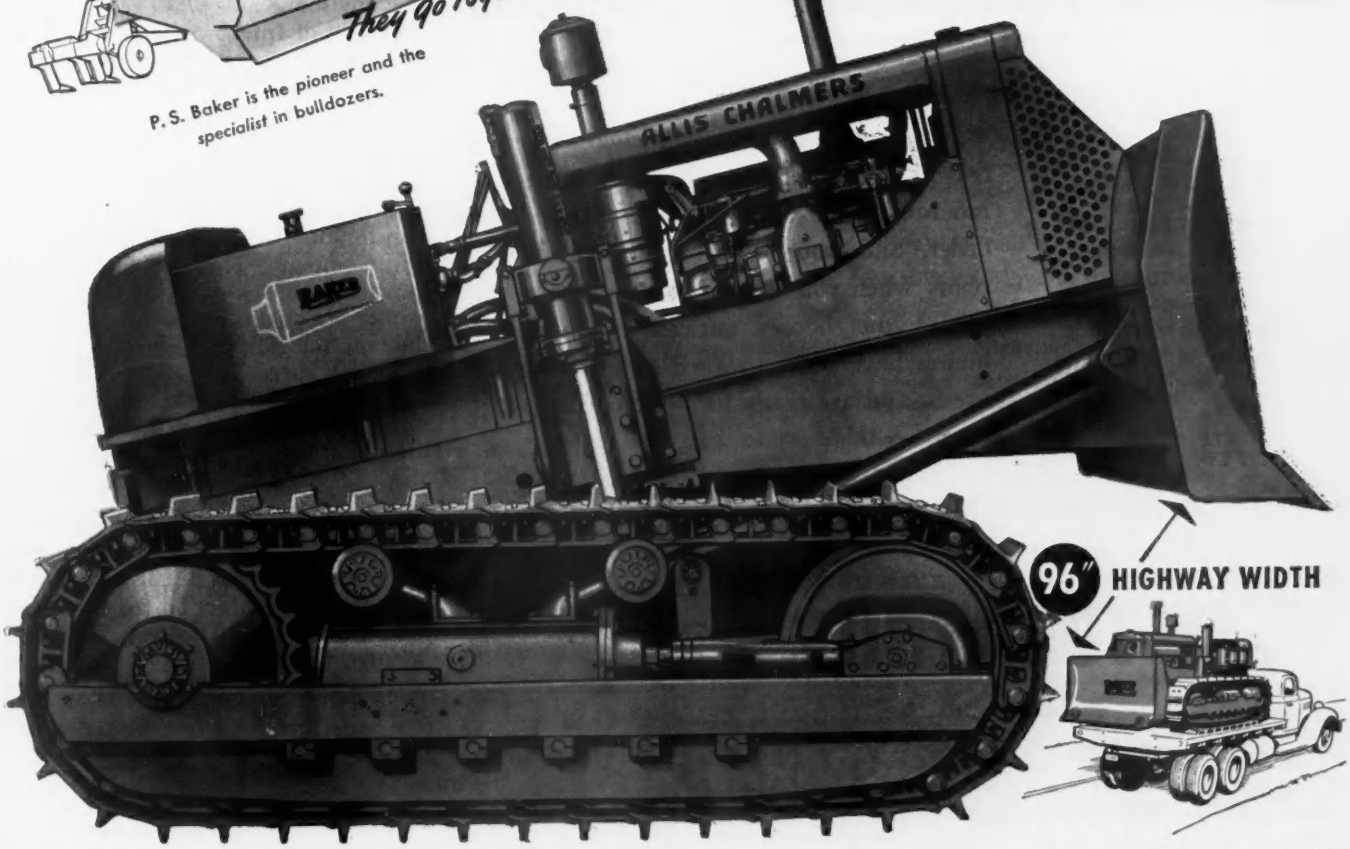


Versatile, Too!

9-X can be hauled even at night—the perfect "job jumper." Pushes big loads for rooting a roadway (left, below).

"Pushover" for clearing—Gets down for rooting; sure-footed with good leverage for dozing trees and walls.

P.S. Baker is the pioneer and the specialist in bulldozers.



JOHN J. WINTERBOTTOM has been named coordinator and Loren F. Kahle, deputy, of a new office to coordinate the worldwide transportation of Standard Oil Company (N.J.).

Associated with Jersey Standard's traffic activities since 1916, Winterbottom will assume duties of the office of coordinator of transportation activities January 1 in counselling the company's domestic and foreign affiliates seeking assistance in working out arrangements to meet their crude and refined product transportation requirements. After starting as a traffic clerk in the Marine department, now Esso Shipping Company, Winterbottom became assistant to the advisor of European affiliates in 1930. In 1938 he became assistant manager of the Marine department's traffic division, and two years later was named manager. In 1942 he went to Aruba as marine manager of Kago Oil & Transport Company, Ltd. Following duty with the War Shipping Administration in 1944, Winterbottom returned to Jersey Standard's marine department as assistant general manager in 1945, and in 1950 was elected executive vice president of Esso Shipping Company.

J. J. Winterbottom

L. F. Kahle

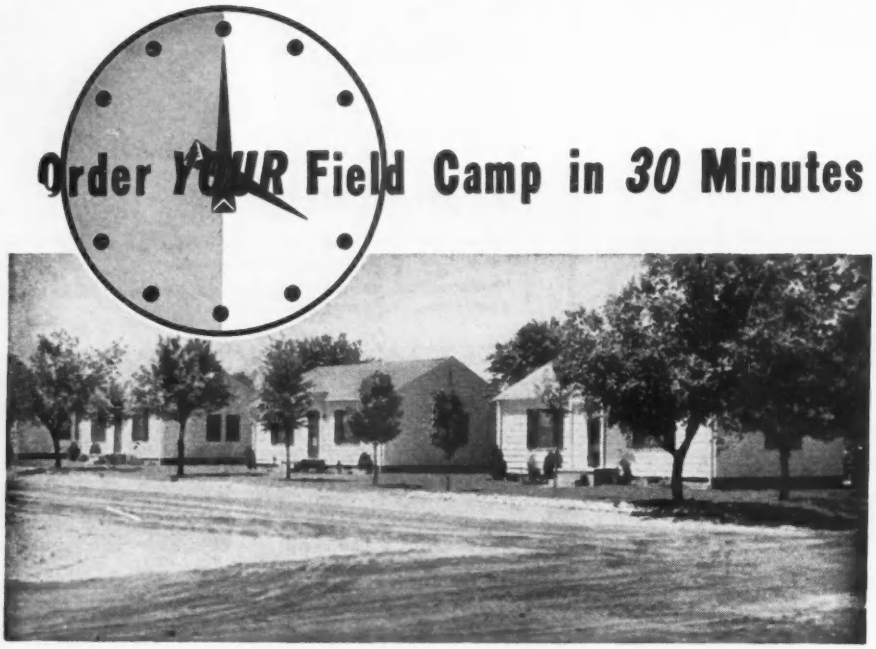
Kahle joined Jersey Standard as a refinery laborer after graduation from Iowa State College in 1924. Until 1941 he was engaged in pipe line and production work in Mexico and Venezuela. After working with the Navy in World War II as an advisor on pipe line construction across Panama, Kahle joined The Carter Oil Company as superintendent of petroleum transportation. In 1944 he was elected executive vice president of Interstate Oil Pipe Line Company, and was named president the following year. From 1949 until mid-1951, when he became assistant to the pipe line advisor, Kahle was executive vice president of Interprovincial Pipe Line Company in charge of construction of the Alberta-to-Lake Superior Canadian oil line.

•

MARVIN L. BROWN has been appointed superintendent of production for the Canadian division of Sun Oil Company. He will have headquarters at Calgary, Alberta. Brown, former regional superintendent of production for Sun's southwest division at Dallas, succeeds George E. Bentley, who resigned. G. E. Dunlap will continue as manager of the Canadian division.

After joining Sun in Texas in 1919, Brown worked in various fields as a roustabout, gang pusher and foreman before he was named assistant superintendent of production for the company's Southwest division at Dallas in 1928.

He moved to Tulsa in 1944 as general superintendent of production for the Oklahoma division and returned to Dallas in 1946 as regional superintendent of production.



•

MANUFACTURERS OF SPECIAL MILLWORK: DISTRIBUTORS OF JOHNS-MANVILLE BUILDING MATERIALS: CURTIS WOODWORK

•

In a half hour you can choose the STURDYBILT, prefabricated, demountable houses you want, place the order, and know your camp will be ready when you want it. Homes, warehouses, tool houses, garages and bunk houses have been designed to suit your needs, and are ready for your selection.

Write for Information

STURDYBILT PREFABRICATED, DEMOUNTABLE HOUSES

SOUTHERN MILL & MANUFACTURING CO. • TULSA, OKLAHOMA

STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

when you use

GEOLOGRAPH

No need to step into trouble! You SEE formation changes, automatically recorded on Geolograph charts, foot by foot, as you drill! You get up-to-the-minute, accurate drilling data 24 hours a day. That's why you save when you log as you drill, with Geolograph.

GEOLOGRAPH
MECHANICAL WELL LOGGING SERVICE
P.O. Box 1291 • Oklahoma City 1, Okla.

ABILENE, HOUSTON, ODESSA, LUBBOCK & WICHITA FALLS, TEXAS
BAKERSFIELD, CALIF — SHREVEPORT & BATON ROUGE, LA
CASPER, WYOMING — OKLAHOMA CITY OKLA

Pursuant to an order by the Owner, We Will Sell at . . .

Public Auction

WEDNESDAY, DECEMBER 12
Starting at 10:00 A.M. (Rain or Shine)

PIPELINE
CONSTRUCTION EQUIPMENT

Consisting of

TRACTORS	DITCHING MACHINES
WELDING MACHINES	COMPRESSORS
BACK HOES	DOPE POTS
TRUCKS–TRAILERS	CLEANING MACHINES
PUMPS	PIPE LINE TOOLS

Located at

3601 N. SYLVANIA ST., FORT WORTH, TEXAS
Inspection from Dec. 4 to date of Sale

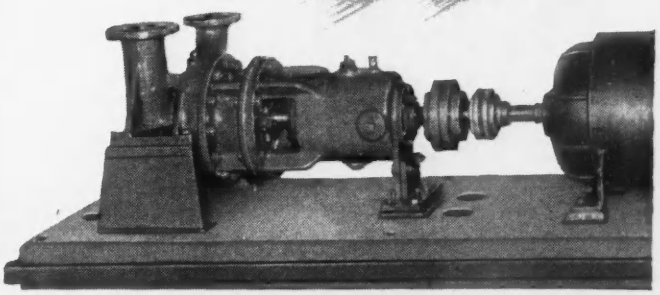
Ask for E. A. Bell

Send for illustrated Folder to:

HETZ AUCTION SALES

P. O. Box 4187 • Phone VAlley 6541
FORT WORTH, TEXAS

ALLIS-CHALMERS
HOT OIL PUMPS
FOR DEPENDABLE REFINERY SERVICE...



BUILT FOR CANADA'S oil and gasoline industry, these pumps are specifically designed to handle hot oil and other liquid hydrocarbons. They can be serviced quickly and easily by removing the complete rotating element — without disturbing the suction piping, the discharge piping or the prime mover.

LOOK AT THESE FEATURES:

1. Extra long water cooled stuffing box.
2. Water cooled oil lubricated bearings.
3. Centreline suspension of casing allows for expansion without distortion. Positive method of alignment for re-assembly is provided.
4. Shaft sleeve sealed at runner prevents corrosive liquids attacking the shaft. Free outward expansion of the sleeve is possible.
5. Spacer type coupling permits removal of rotating element without disturbing suction and discharge piping or prime mover.
6. *ALL* wearing parts replaceable.
7. Balanced hydraulic design.
8. Low NPSH requirements.
9. High degree of interchangeability.
10. Available in special materials to combat all corrosive and temperature conditions.
11. Cantilever shaft construction with extra heavy section between bearings minimizes vibration and subsequent stuffing box maintenance.
12. Water cooled pump pedestal optional.

CANADIAN ALLIS-CHALMERS (1951) LIMITED,
P.O. BOX 37, MONTREAL, QUEBEC

MADE IN CANADA

51-CAL-18

CANADIAN ALLIS-CHALMERS

3 proven ways to get L-O-N-G-E-R Thread Life!

Yes sir . . .
24 HOUR SERVICE

on these and many other quality petroleum products! We have branch warehouses in many areas! Call us collect — anytime!

PETROLEUM DISTRIBUTING COMPANY

BOX 203 - HOUSTON, TEXAS - CHarter 5648

Quality Oil Field Lubricating Oils and Greases

John M. Vetter has been elected first vice president of Pan American Production Company, Houston. Vetter, heretofore vice president, is one of the original employes of the company, having joined it in 1935. He was employed in various managerial positions until January 1, 1950, when he was elected vice president.

John M. Vetter

Vetter obtained his B.S. degree in geology from Nebraska University in 1922, then joined Mexican Eagle Oil Company at Puerto, Mexico, as field geologist. Two years later he resigned and returned to Houston to join Rio Bravo Oil Company as geologist. He was later advanced to superintendent of land and geological work for that company. From 1928 until he joined Pan American Production he was engaged in consulting work in Houston.

•

Kent Ridley has resigned from the Land department of Shell Oil Company and opened his own lease and royalty offices in Corpus Christi. During the past 18 years spent in land work for Shell, Ridley has had experience in the Gulf Coast, South Texas, Arkansas, Louisiana and Mississippi areas. The past ten years have been in South Texas. Ridley, a licensed lawyer, is the son of the late **J. Kent Ridley**, managing editor of *The Oil Weekly* (now WORLD OIL) for more than 20 years.

•

William K. Whiteford, former president and board chairman of The British-American Oil Company, Ltd., Toronto, has been elected a director and executive vice president of Gulf Oil Corporation.

Elevated to the vice presidency also are two present employes, **W. L. Naylor**, comptroller, and **Ralph O. Rhoades**, executive assistant to the vice president in charge of production.

In the Production department, **Harry G. Taylor, Jr.**, has been appointed chief of the Crude Oil Supply and Disposition branch, Pittsburgh office.

Whiteford was graduated from Stanford University with majors in engineering and geology, and began his oil career in the early twenties as a roustabout in the oil fields of Southern California. Shortly thereafter he joined Barnsdall Oil Company and was transferred to Tulsa. He successively became general superintendent and vice president and general manager of Barnsdall's Mid-Continent division. In 1934 Whiteford became executive vice president of British-American's American Producing Company, Tulsa, and in 1942 he became executive vice president of the parent company and moved to its Toronto headquarters, becoming president the following year. This year he was elected chairman of British-American.

Naylor, who joined the company in Houston in 1920, will continue as comptroller. In 1923 he was sent to Tampico, Mexico, as chief accounting and financial officer there. In November, 1928, he was transferred to the comptroller's staff in Pittsburgh, and in March, 1934, was elected assistant comptroller of the corporation. In May, 1948, he was elected comptroller and is a director of various Gulf subsidiaries.

Rhoades joined Gulf in 1926 as a geologist, and was sent to Colombia, South America, on his first assignment. Upon completion of this job he was sent to the Midland and Far East, and spent four years in the Netherlands East Indies. After two years back in the Pittsburgh office, he went abroad once more, working in Kuwait, Great Britain, and a number of countries in Europe. He returned to Pittsburgh in 1940, and has subsequently served as assistant staff geologist, chief staff geologist, chief of Land and Exploration branch of the Production department, and as executive assistant to the vice president in charge of production.

Taylor's duties will consist of coordination of Production department activities with those of other Gulf operations. A Gulf employe since 1921, Taylor was first in the Purchasing department, then was transferred to the Production-Pipe Line department a year and a half later. Upon reorganization of the Production-Pipe Line department into two separate departments and the subsequent transfer of the chief of the Crude Oil Supply and Disposition branch to the newly organized Crude Oil Purchasing department, Taylor was appointed acting chief of the Production department, Crude Oil Supply and Disposition branch, and has served in that capacity until his most recent appointment.

•

Dewey A. Jordan has joined Edwin B. Cox and Edwin L. Cox, oil producers with general offices in the Magnolia Building, Dallas, as superintendent of production.

Dewey A. Jordan

Jordan has been with The Atlantic Refining Company for the past 17 years as district and general superintendent. Jordan is vice chairman of the API's Southwest Technical Advisory Committee on Vocational Training.

•

C. H. Sample, consulting geologist formerly with offices in the Niels Esperson Building, Houston, and **A. F. Childers, Jr.**, formerly with Gulf Oil Corporation, have opened geological consulting offices at 901 Southern Standard Building, Houston.

•

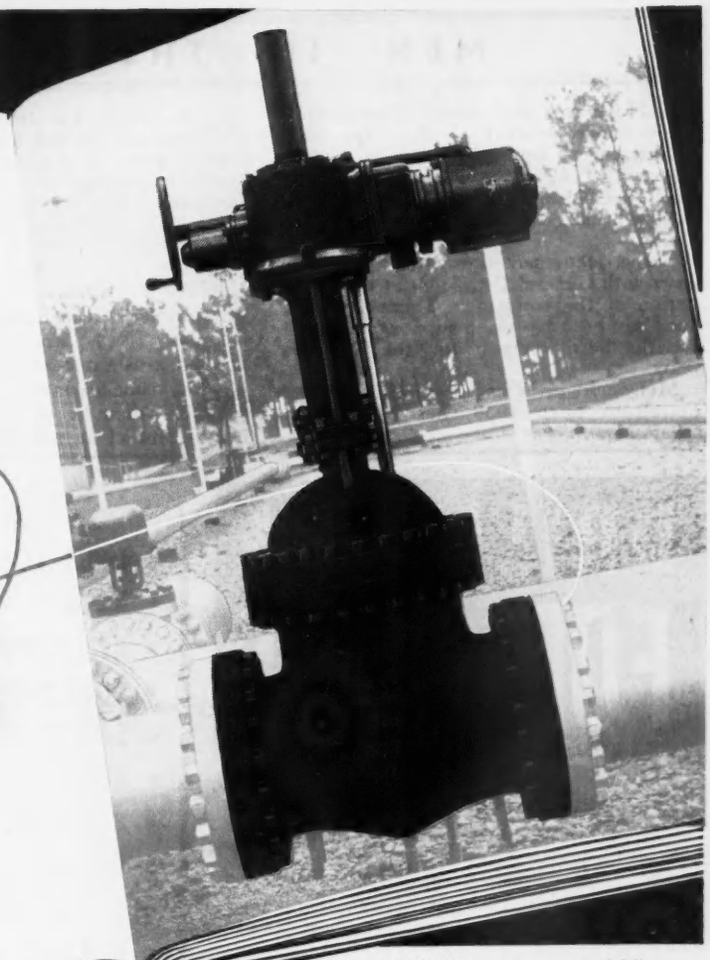
R. D. Roberts, geophysical field superintendent for Sohio Petroleum Company, Houston, has been promoted to Western division geophysicists, and will be headquartered in Oklahoma City.

Jesse L. George, Jr., district geologist in Houston, has moved to Lafayette, La., as district geologist.

KEROTEST

Full Opening

PIPE LINE VALVES



A KEROTEST motor operated full opening 18" Pipe Line Valve carrying 1000 p.s.i. pressure.

Easy Clearance FOR SCRAPERS

FULL ROUND OPENING—OVERSIZE SEAT RINGS!

23

PIPE LINE COMPANIES

are now using Kerotest Valves —among them some of the world's outstanding operators whose engineering ability has marked them as leaders in the field.

KEROTEST

- ✓ KEROTEST Pipe Line Valve operating features and capacities are designed for the heavy duty requirements of modern pipeliners.
- ✓ KEROTEST Pipe Line Valves have been operating for years on gas lines, crude, gasoline and LPG lines —*proved* in service.
- ✓ KEROTEST Pipe Line Valves are in operation today on pipe lines throughout the world.
- ✓ FULL RANGE of sizes available with handwheel, gear, motor or cylinder operation.

KEROTEST

MANUFACTURING COMPANY

PITTSBURGH 22, PA.

New York • Chicago • Charleston, W. Va. • Tulsa • Odessa • Houston
Los Angeles • St. Louis • Toledo • Richmond • Baltimore

L. L. Tarne has been named Northern division superintendent of the Pipe Line department of General Petroleum Corporation, and **C. A. McDonald** has been appointed assistant division superintendent. Both will make their headquarters at Taft, Calif.

Tarne, who spent the first 20 of his 29 years with General Petroleum at the Lebec station of the company's Tehachapi pipe line, has been assistant superintendent of the Southern division for the last five years.

McDonald, who has been with General Petroleum since 1938, has been safety supervisor.

Max B. Payne has been appointed vice president and general manager of Natural Gas Corporation of California. Payne was formerly geologist for Signal Oil & Gas Company, with headquarters at Bakersfield, Calif. His new offices will be in San Francisco.

•

George W. Schwer, a member of the Comptroller's department of Standard Oil Company (N. J.) since 1933, has been appointed assistant comptroller. Schwer first became associated with Jersey Standard in 1929 when he joined the Purchasing department of an affiliated company.

W. C. MacMillan

E. F. Battson

E. F. Battson, Houston, administrative vice president of Continental Oil Company, has been elected a director. **W. C. MacMillan,** Houston, senior vice president, has resigned as a director due to ill health.

Battson, who has been with Continental nearly 30 years, held various positions in the Sales department before his assignment early this year as administrative vice president.

MacMillan joined the company in 1928, doing geological work. He rose through exploration and production assignments, being elected vice president in charge of production in 1943. He has successively served as vice president and administrative assistant to the president, executive vice president, and senior vice president.

•

O. N. Knox, Tulsa, a vetaran of 33 years in the Production department of The Carter Oil Company, has been named general superintendent. He succeeds **W. A. Watkins,** who has been named assistant to **F. M. Darrough,** Tulsa, general counsel and vice president. Knox has been assistant general superintendent and previously had been Central division superintendent with headquarters at Seminole, Okla.

H. R. Shannon, Oklahoma City, has been named production superintendent for the Northwest division, with headquarters in Denver. Shannon, who has been with Carter 26 years, has been in charge of operations in Oklahoma and Kansas the past four years and previously handled Carter production operations in Montana and Wyoming.

Roger S. Frazier, Oklahoma City, is the new division petroleum engineer for the Northwest division, Denver. Frazier began service with Carter in 1938 on graduation from the University of Michigan.

J. L. Rogers, Oklahoma City, has been named Central division superintendent, succeeding Shannon. Rogers joined Carter since 1935, and was assistant division superintendent, Oklahoma City, before taking his present post.

H. L. Spillers, Seminole, Carter district superintendent, was named assistant division superintendent in Oklahoma City, and **R. B. Chapman,** Tulsa, was named assistant division engineer in Oklahoma City, succeeding Frazier.

•

T. W. Jenkins, Jr., employe of The Texas Company's Land department, South Texas division, Producing department, received the Texaco Life Saving Award, the highest safety award of the company. Jenkins is credited with saving a man's life in a Houston residential fire.

•

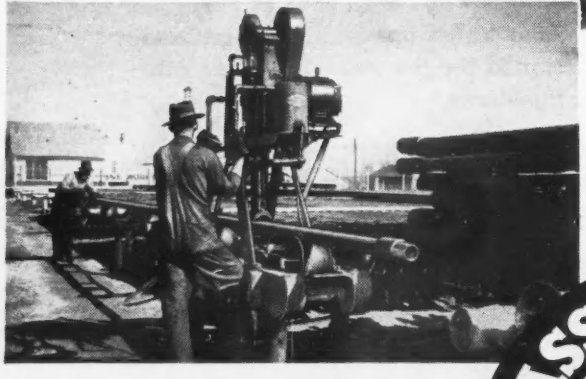
Robert Womack, Jr., has opened offices as a consulting geologist in the Millsaps Building, Jackson, Miss.

DRILL PIPE FOR RENT

ALSO
- DRILL COLLARS
- KELLYS
- KELLY DRIVE BUSHINGS
- CORE BARRELS
- SAFETY JOINTS
- ROTARY SLIPS
- BLOWOUT PREVENTERS
- ROTARY TONGS
- ELEVATORS
- ROTARY SUBS

No need to tie-up operating capital in drilling equipment! Just call "Associated"! Drill pipe and tools are maintained in excellent condition, ready for immediate delivery on rental basis. All six yards (listed below) are equipped to give you fast 24-hour service!

(*Right*) All pipe returned to our yards is steam cleaned and rigidly inspected.



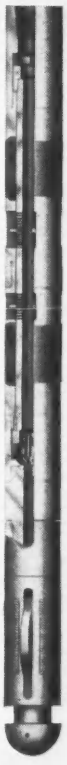
(*Left*) Returned pipe is straightened, repaired to first class condition and threads properly lubricated before being replaced on racks.

ASSOCIATED A OIL FIELD INC. RENTALS

MAIN OFFICE — HOUSTON, TEXAS

HOUSTON, TEXAS Phone CApitol 9596
OKLAHOMA CITY Phone 62-3555
ALICE, TEXAS Phone 1348
NEW IBERIA, LA. Phone 1553-J
ODESSA, TEXAS Phone 2331
HARVEY, LA. Phone UPtown 8585
CASPER, WYOMING

Quick Production Zone Cleanups with the BOWEN LINER WASHER!



Positive high pressure washing action of the Bowen Liner Washer—plus the return circulation feature—enables you to completely remove sand and inert material from behind the liner—on just one trip **into the hole**

Operation is simple. The washer is moved up the liner in easy stages, and at each setting a section of the liner is packed off to permit concentration of pressure through the tool and out through the perforations at that point. Pressure can be built until circulation is established—an important point.

Bowen Liner Washers are available in a full range of sizes from your nearest Bowen Service Store—which is open 24 hours a day for your convenience. Next time call Bowen!

SR BOWEN CO

MAIN OFFICE AND PLANT:
11008 SOUTH NORWALK BOULEVARD
SANTA FE SPRINGS, CALIFORNIA
EXPORT OFFICE
30 ROCKEFELLER PLAZA
NEW YORK CITY, N.Y., U.S.A.
EXPORT REPRESENTATIVE: VAL R. WITTICH JR.

SMOOTHNESS OF BRAKING...

. . . another reason why drillers prefer

Standco NO-SMOKE BRAKE LINING

There's no grabbing when Standco Lining is used. It has a nice feed-off and slight lever pressure controls the heaviest strings of pipe.

More deep wells have been drilled with Standco than with all other blocks combined.

Be sure Standco No-Smoke Brake Lining is on all your rigs.

STANDCO BRAKE LINING COMPANY

Factory and General Offices

2701-2801 Clinton Drive — Houston, Texas

This TRAIL-BLAZING EMSCO DIESEL-ELECTRIC RIG USES Westinghouse PNEUMATIC CONTROLS

Built by Emsco from basic ideas developed by Standard Oil Company of California, this unusual new 2400 hp rig has created endless comment because of its ingenuity in design and construction, and its potential for increased effectiveness and economy in deeper hole operations.

It is anticipated that this Rig will provide operating efficiency and sensitivity hitherto unattainable . . . and to assure full realization, W A B Pneumatic Controls are used. Controls shown on the console include drawworks brake; rheostat positioning for drawworks and rotary table motors; multiple cat heads; drum clutches; dynamatic brake; and throttles on both engines.

W A B Controls make the *best* rigs perform better.

WESTINGHOUSE
AIR BRAKE COMPANY
WILMERDING, PENNA.
INDUSTRIAL PRODUCTS DIVISION

Factory Branch: Emeryville, Calif. Distributors throughout the United States. Consult your Classified Directory. Distributed in Canada by: Canadian Westinghouse Co., Ltd., Hamilton, Ontario

Transfers and Promotions:

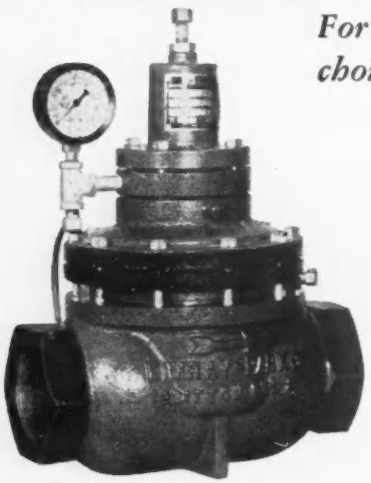
Harold E. Snider, intermediate petroleum engineer for Sinclair Oil & Gas Company, Sand Draw, Wyo., promoted to assistant district foreman. **Ralph W. Newport**, senior clerk, Ardmore, Okla., transferred to Tulsa. **Billie B. Brogdon**, intermediate clerk, Tulsa, promoted to senior clerk and transferred to Ardmore. **Herman L. Hensel**, junior petroleum engineer, Oklahoma City, promoted to intermediate petroleum engineer and transferred to Delaware, Okla. **Charles J. Eskridge**, senior petroleum engineer, Pampa, Texas, promoted to district foreman, and transferred to Odessa, Texas. **Fred W. Kunkel**, junior petroleum engineer, Bairoil, Wyo., promoted to intermediate petroleum engineer. **George V. Dunn**, intermediate petroleum engineer, Lindsay, Okla., promoted to senior petroleum engineer and transferred to Seminole, Okla. **George Platt**, intermediate petroleum engineer, Kiefer, Okla., transferred to Tulsa. **Ollie W. White**, senior clerk, Delaware, reclassified as warehouseman. **Walter W. Armor**, senior clerk, Chase, Kansas, transferred to Delaware. **W. H. Upton**, district foreman, Alma, Okla., transferred to Kiefer. **Wyatt L. Sisson**, Sinclair's district foreman, Kiefer, transferred to Alma.

Howard M. Walker has been promoted to Magnolia Petroleum Company's general offices in Dallas as assistant general superintendent of the Producing division from assistant division superintendent of the Gulf Coast area with headquarters in Houston. **Wade G. Moriarty** promoted to assistant division superintendent, Gulf Coast, from district superintendent of Brownfield district in West Texas. **John R. Hissom**, promoted to district superintendent of Brownfield district, from assistant district superintendent. **Joseph M. McLaughlin**, production foreman at Brownfield district, promoted to assistant district superintendent. **John S. Goodrich**, former production foreman in Kermit district, promoted to assistant district superintendent. **Horace Gale Brelsford**, senior petroleum engineering assistant, Kermit, transferred to Producing division as production foreman. **Garland C. Rutherford**, assistant foreman, Falfurrias Producing district, promoted to production foreman in the Snyder area of the Brownfield Producing district. **Hudie H. Barber**, promoted from assistant foreman to production foreman in the Jackson, Miss., area of the Shreveport Producing district. **Howard W. Shields**, assistant foreman in the Salem, Ill., Producing district, transferred to Electra, Texas, district and promoted to production foreman. **Adolph Sieker**, formerly assistant foreman in Magnolia's Chase, Kansas, Producing district, promoted to production foreman and transferred to Brownfield district. **William L. McDonald, Jr.**, petroleum engineer at Morgan City, La., Producing district, transferred to Kermit Producing district, Kermit, Texas. **Charles C. Baker**, senior petroleum engineering assistant, moved from Eldorado, Kansas, district to the Kermit Producing district. **Lee A. Keeling**, petroleum engineer at Kermit, moved to Eldorado. **W. H. Newman**, promoted from marine drilling tools supervisor in Magnolia's Louisiana-Gulf division to assistant drilling tools superintendent of the Gulf Coast division. In Magnolia's Exploration division, **Ezra H. Powell**, district geologist at Tyler, Texas, transferred to San Antonio. **Joseph Neely**, district geologist at Shreveport, transferred to Tyler. **Kenneth F. Keller**, geologist at San Antonio, promoted to district geologist at Shreveport.

In Humble Oil & Refining Company's Production department, **Eugene S. Pennebaker, Jr.**, senior petroleum engineer, transferred from Petroleum Engineering division, Houston, to Southwest Texas division office. **Ralph K. Hill**, petroleum engineer, transferred from Gulf Coast office to Petroleum Engineering division, Houston, as senior petroleum engineer. **Charles D. Enrhardt, Jr.**, petroleum engineer, moved from Friendswood district, Gulf Coast division, to Petroleum Engineering division, Houston, as senior petroleum engineer. **Norman A. Nelson**, senior petroleum engineer, transferred from Petroleum Engineering to Friendswood district. **Samuel T. Sikes, Jr.**, supervising petroleum engineer, transferred from Petroleum Engineering, Houston, to Gulf Coast division office. **Jeremiah Ward III**, senior petroleum engineer, moved from Gulf Coast division office to East Texas division office as supervising petroleum engineer. **Willis P. Orr**, senior petroleum engineer, transferred from Petroleum Engineering division, Houston, to Hawkins district, East Texas division.

KIMRAY-PARKS

BACK PRESSURE REGULATORS



For the past five years the popular choice of oil field production men!

Convertible to Pressure Reducing Service Without Additional Internal Parts

. . . and . . .

IMMEDIATE DELIVERY ON

2", 3", 4" Screwed or Flanged, and 6" Flanged —— through distributors listed below.

PATENT PENDING

Check these features:

- BUILT-IN PILOT
- NON-BLEED CONTROL
- SINGLE LINE SIZE SEAT
- BUBBLE TIGHT SHUT-OFF
- POSITIVE CLOSE CONTROL (No Hunting)
- PACKAGED UNIT (ready for the line)

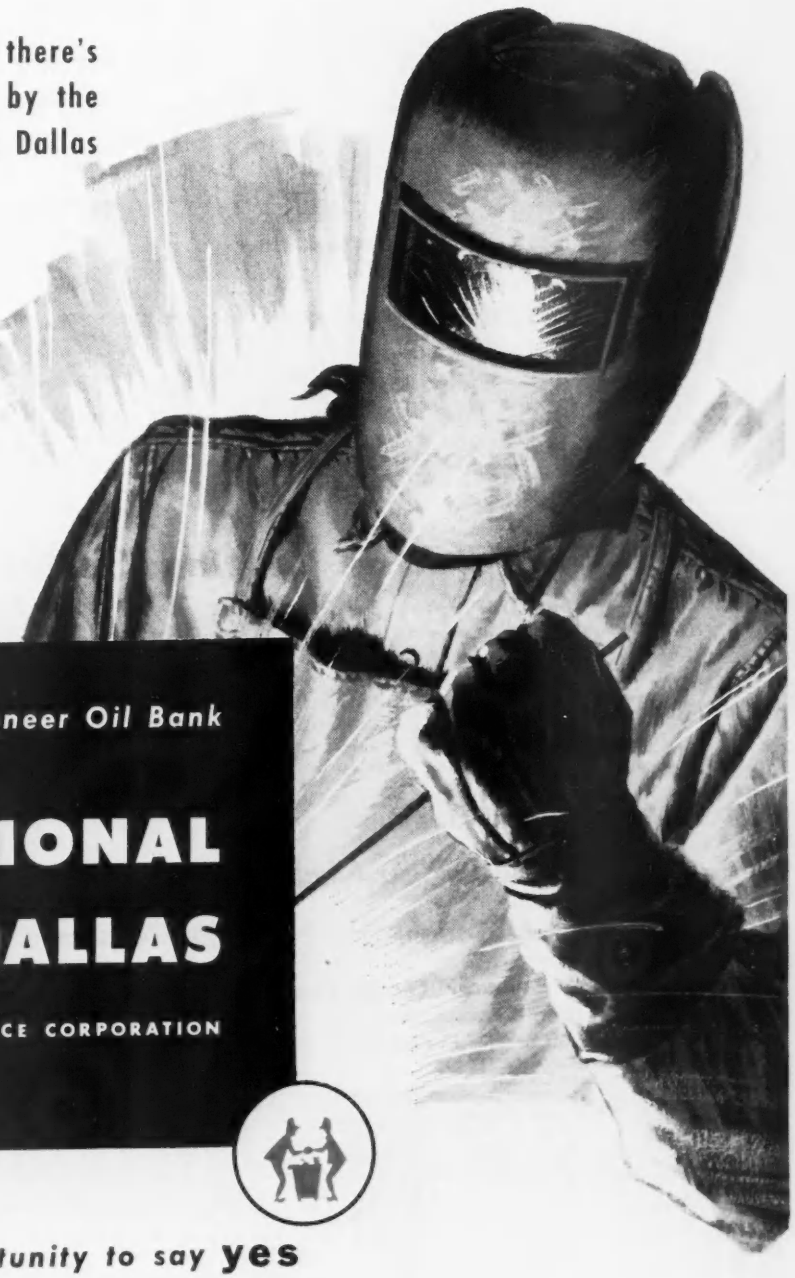
MANUFACTURED BY KIMRAY INC. OKLAHOMA CITY U. S. A.

Immediate Delivery Through:

Merla Sales & Service Co., Houston, Tex.
Engineering Service Co., Corpus Christi, Tex.
Control Equipment Inc., Odessa, Tex.
A. L. Bethel, Graham, Tex.
Materials Service Co., Los Angeles, Calif.
Kimray, Inc., Oklahoma City, Okla.
Merla Sales & Service Co. (c/o Bill Ussury Tool Co.), New Iberia, La.

AHEAD OF THE TORCH

First there's financing by the FIRST in Dallas



the Southwest's Pioneer Oil Bank

FIRST NATIONAL BANK *in* DALLAS

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

Give us an opportunity to say **yes**

Robert F. Pielsticker has been elected president of Stanolind Oil Purchasing Company, succeeding **A. C. Sailstad,** resigned, who accepted a position with Standard Oil Company (Indiana).

Pielsticker was formerly executive assistant and manager of pipe lines and crude oil purchasing for Skelly Oil Company. While with Skelly he was employed in the Marketing, Sales, Crude Oil Purchasing and Pipe Line departments at Kansas City, Missouri, El Dorado and Wichita, Kansas.

•

D. L. Wolfe, vice president of Stanolind Oil Purchasing Company, has been elected executive vice president, and **C. G. Irsch,** director in charge of accounting and finance, has been elected financial vice president.

•

G. S. Warner, who started with The Texas Company in 1917, has retired as auditor, Comptroller's department. He is succeeded as assistant general auditor by **J. M. Cire,** formerly assistant auditor.

•

John H. Gray has been named director of public relations for Lion Oil Company, El Dorado, Ark. Gray formerly was in an executive position with The Wall Street Journal's Southwest Edition in Dallas.

•

L. C. Jarrell has resigned from The Texas Company and has opened consulting offices at Ardmore, Okla., doing subsurface geology and production engineering. A graduate of the University of Oklahoma, Jarrell started working for The Texas Company as a roustabout. He worked in the division office in Tulsa, and was later promoted into the Producing department in the Seminole field. The remainder of his experience was obtained in other southern Oklahoma fields.

L. C. Jarrell

•

R. N. Harding, geophysical supervisor at Denver for The Texas Company, has been promoted to assistant to division manager, Geophysical division of the Producing department. He succeeds **B. H. Treybig, Jr.,** resigned. Harding, who will be assigned to the Houston office, received the B.S. degree in civil engineering from Texas Technological College in 1936. He was employed by The Texas Company in 1937 as computer and served in various capacities in the Geophysical division before his promotion to supervisor.

•

Harry C. Carr, chairman of the board of the First National Bank of Philadelphia, has been elected to the board of directors of The Atlantic Refining Company. He fills the vacancy caused by the retirement of **E. H. Blum,** former vice president of Atlantic in charge of crude oil production.

•

F. A. Menken has been named a vice president of Tide Water Associated Oil Company and manager of exploration of the company's Western division. He succeeds **L. C. Decius,** retired.

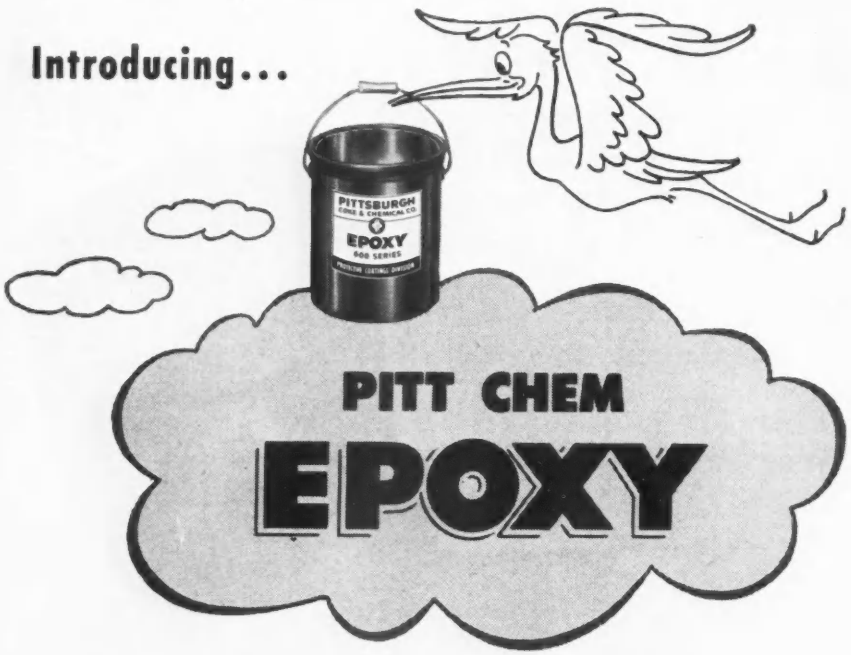
Menken has been with Tide Water since graduating from Stanford University in 1926 with an A.B. degree in geology and petroleum engineering.

•

B. C. Broocks, former superintendent of Sun Oil Company's Corpus Christi district, has been named regional superintendent of production in the Southwest division. He succeeds **Marvin L. Brown,** who moved to Calgary, Alberta, as superintendent of production for the Canadian division. Broocks' new headquarters are in Dallas, and he will supervise production activities in the East Texas, McAllen and Corpus Christi districts.

Robert E. Bates, drilling superintendent in Southwest Texas for the past 12 years, succeeds Broocks at Corpus Christi.

Other Operating department changes include the appointment of four new assistant district superintendents: **George F. Carson,** Corpus Christi; **C. W. Underwood,** McAllen; **Cecil A. Colville,** Midland; and **R. P. Smith,** East Texas.



A New Protective Coatings Series for *Elevated Working Temperatures*

The new Pitt Chem 600 Series of baked Epoxy Coatings provides you with an improved and specialized weapon for combating industrial corrosion. Effective for many applications involving elevated temperatures, Pitt Chem Epoxy Coatings offer these important advantages:

✓ ***Excellent Flexibility***

✓ ***Outstanding Alkali Resistance***

✓ ***Toughness—High Mar Resistance***

✓ ***Good General Chemical Resistance***

Send for Additional Information on* PITT CHEM EPOXY *Today!

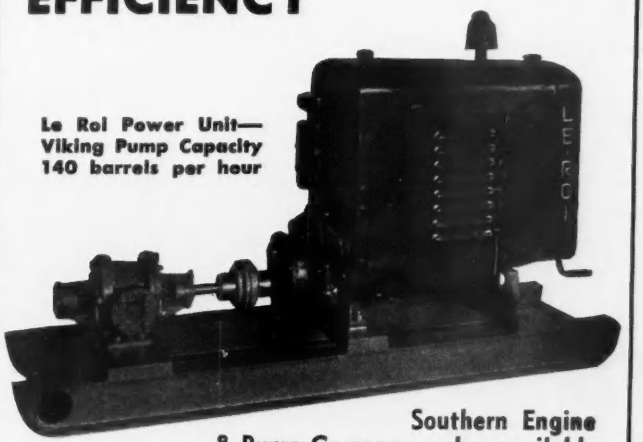
★ Hot Applied Tar Base Coatings
★ Cold Applied Tar Base Coatings
★ Alkyd Coatings
★ Chlorinated Rubber Coatings
★ Vinyl Coatings
★ Phenolic Coatings
★ Epoxy Coatings

WAD 3925

Protective Coatings Division
PITTSBURGH
COKE & CHEMICAL CO.
GRANT BUILDING · PITTSBURGH 19, PA.

COAL CHEMICALS • AGRICULTURAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

THE RIGHT TEAM FOR EFFICIENCY



Le Roi Power Unit—
Viking Pump Capacity
140 barrels per hour

Southern Engine & Pump Company makes available to you 40 years of "KNOW HOW" in your pumping requirements.

• Complete units and replacement parts at all branches.

SOUTHERN ENGINE & PUMP COMPANY

MANUFACTURERS • MACHINERY FACTORS • CONTRACTORS

Houston - Dallas - Kilgore - San Antonio - Edinburg
Corpus Christi, Texas; Houma and Lafayette, La.

JUSTRITE

SAFETY LIGHTS for SAFETY FIRST!
for use in hazardous locations

JUSTRITE ALL PURPOSE SAFETY LANTERN

Twin bulb design. Emergency bulb instantly available. Points in any direction. Strong spot beam, plus light in all directions. Uses lantern battery. Clear globe protected by wire frame. Safety kick-out bulb sockets. $7.25 less batteries. Model 2144-S.

Model 2144-S

Model 2146-S
Twin bulb design. Can be switched instantly for flashing or steady light. $9.80 less batteries. Both models are approved by Underwriters Lab., Inc., for Class 1, Group D hazardous locations; U. S. Bureau of Mines; and U. S. Coast Guard Merchant Marine technical division.

SAFETY FLASHLIGHT
FOCUSING — SELF STANDING

Three cell case is more compact than most two cell lights. Bright (1,500 foot) focusing light. Shock resistant case. Spark proof. Completely insulated. $4.00 less batteries. Underwriters Lab. approved for use in all Group D, Class 1, hazardous locations.

Order from your jobber.

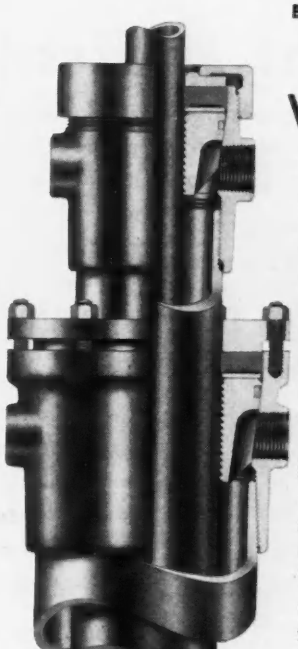
Model 1717-S

FREE CATALOG
Write Dept. WO

JUSTRITE MANUFACTURING CO.
2061 N. Southport Ave.
CHICAGO 14, ILL.

FOR STRENGTH

USE STEEL FORGINGS BY BEAUMONT WELL WORKS



An example of the strength and safety built into a product by Beaumont Well Works Forgings.

Beaumont Well Works is equipped with the tools and the know-how to strengthen your product with forgings. Carbon, alloy, and stainless steel forgings made to your specifications will help reduce your costs of manufacture and will put more sales appeal in your product. Now, without investing a cent in forge equipment, you can compete successfully with the largest manufacturers of oil field equipment. Investigate the advantages of steel forgings, then call on Beaumont Well Works for specific engineering and manufacturing information concerning your product.

Commemorating the Fiftieth Anniversary of Spindletop.

BEAUMONT WELL WORKS COMPANY
INCORPORATED
BEAUMONT, TEXAS

H. O. Miller has been appointed senior development geologist on the staff of The California Company's chief development geologist in New Orleans.

Other California Company appointments include those of **C. A. Christensen** as division construction engineer in the North Louisiana and Mississippi division, and **C. J. Courtney** as division development geologist in the Gulf Coast division.

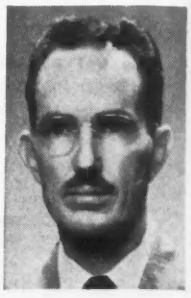
•

James E. Clark, Coastal division manager at Ventura, Calif., in Shell Oil Company's West Coast Exploration and Production staff, has been named manager of the company's Rocky Mountain division and moved to Casper, Wyo. His new territory includes the Montana section of the Williston Basin. Clark replaces **Paul L. Kartzke**, who went to the New York head office on special assignment.

Clark joined Shell in 1933 as a pipeliner at Long Beach, became a division production foreman in 1941, and was elevated to manager at Ventura in 1948. He was graduated from Stanford University just prior to starting with Shell.

B. P. Eastin, presently manager of Shell's Los Angeles Basin operations, replaces Clark at Ventura as manager of Coastal division.

G. C. Clark has resigned as district geologist with Stanolind Oil and Gas Company and has opened consulting offices in the Fair Foundation Building, Tyler, Texas.



G. C. Clark

Clark's work with Stanolind during the past 17 years included three years in the Gulf Coast Geophysical department, and 14 years in the North Texas-New Mexico division where he did subsurface and evaluation work in Amarillo, Wichita Falls, Fort Worth and Midland. Prior to going to Tyler in 1946, Clark was district geologist at Amarillo, having supervision of exploration work in the Texas and Oklahoma Panhandle, Northern New Mexico, and Southern Colorado areas.

R. T. Stotler, Jr., from Alberta, Canada, replaces Clark as district geologist at Tyler.

•

B. O. Smith, The Texas Company's supervisor of industrial relations, West Texas division, Producing department, has been promoted to the office of **L. J. Whetsell**, assistant to manager (industrial relations), Producing department, and transferred from Fort Worth to Houston. He succeeds **Joe A. Hale**, who has been assigned to handling land matters for the manager's office.

E. E. Callaway, assistant supervisor of industrial relations, South Texas division, succeeds Smith as supervisor of industrial relations, West Texas division.

M. C. Pitts, Texaco safety engineer with headquarters in Atlanta, has been named to replace Callaway in the South Texas division.

E. L. McIntyre, safety engineer with headquarters at Fort Worth, has been transferred to the newly-created job of assistant supervisor of industrial relations in Callaway's office at Fort Worth.

•

J. E. Matter has been made vice president in charge of exploration for The British-American Oil Producing Company. Matter has moved his offices to Tulsa from Fort Worth, where he was division exploration manager of the Southwestern division.

J. E. Matter

Matter was graduated from U.C.L.A. with a degree in geology, then spent two years studying in Germany at the University of Munich and the Freibuerg School of Mines. After two years in Shell Oil Company's Geology department, he joined British-American doing geology work in the Rocky Mountain area and in California. In 1945, he was made exploration manager for the California division. He remained there until January, 1950, when he was transferred to Fort Worth to organize the Southwestern division, which includes all West Texas and New Mexico.

Rugged and Handy For Small Rigs!

MARTIN-DECKER

Production Model

Clipper "Sealtite" Weight Indicators

A Martin-Decker Production Model Weight Indicator Gauge can be placed anywhere you want it—at the brake, in front of the driller, over next to the line permanently attached to the mast where it can be seen by the driller—without danger or damage from dead line vibration or whip, and with it you can read your loads with precision in pounds. Equipped with supersensitive Vernier for maximum sensitivity and readability. Vacuum loaded at the factory and permanently sealed. Easy to install and move. No adjusting, no pumping.

The Clipper "Sealtite" above is permanently installed on a Hopper Blitz trailer-mounted rig. Lowering the mast and moving in no way interferes with this installation.

- RUGGED AND DEPENDABLE
- KEEPS GAUGES OFF DEAD LINE
- PERMANENT INSTALLATION
- EASY VISIBILITY
- ELIMINATES DEAD LINE WHIP
- LASTS LONGER

Install your Clipper Production Model permanently on your mast and forget it. It's there when you set up, when you tear down, and when you move.

HOME OF THE WEIGHT INDICATOR

MARTIN DECKER CORP.

LONG BEACH, CALIFORNIA

SAN JOAQUIN VALLEY: T. J. CULLEN, BAKERSFIELD, CALIFORNIA
MID-CONTINENT DISTRIBUTOR: REED ROLLER BIT COMPANY, HOUSTON, TEXAS
CANADIAN DISTRIBUTOR: REED ROLLER BIT COMPANY OF CANADA, LTD., CALGARY & EDMONTON, ALBERTA

DEATHS

Cliff Van Buren Perry, 70, member of Skelly Oil Company's legal staff, died October 22 in Kansas City, Mo.

•

Frederick A. Schultz, 63, founder of several Canadian oil companies, died October 3 in Calgary. Schultz started his oil career at Turner Valley in 1913, and founded Structure and Model Oils Limited. In 1936 he formed Alberta Oil Incomes Limited, and in 1937 Major Oil Investments Limited, of which he was owner and president at the time of his death. Schultz was also secretary and managing director of Continental Oil Company of Canada Limited, which he founded in 1940; president of Marland Industrial Corporation Ltd., Western Petroleum Operators Limited, and Altario Oil Operators, Limited. He was a director of Mutual Holdings Limited, Service Corporation Ltd., Widney Oilwell Drilling Company, and Kanor Oil, Gas & Water Lines Ltd.

•

Frederick M. Goddard, 54, of Tulsa, a long-time accountant with Amerada Petroleum Corporation, died October 12 at Clearwater, Fla.

•

David Brooks Layton, 75, retired Oklahoma Independent oil man for whom the oil-bearing Layton sand was named, died October 19 in Broken Arrow, Okla.

•

M. Elmer France, 73, of Oklahoma City, died October 19. He was a pioneer developer of the Bristow, Okla., pool.

•

Donald W. Gravell, palentologist for Cuban Gulf Oil Company at Havana, died October 14. Author of several publications on paleontology and regarded as an authority on larger foraminifera, Gravell was geologist and paleontologist for Gulf Oil Corporation in Houston from 1929 to 1940. He left Houston in 1940 and spent four years in Cuba with The Atlantic Refining Company. He later went to Caracas, Venezuela, for Atlantic before returning to Cuba for Gulf in 1948.

•

W. C. MacMillan, 56, who resigned last month as senior vice president of Continental Oil Company (see page 316), died November 23 at Glendale, Calif.

•

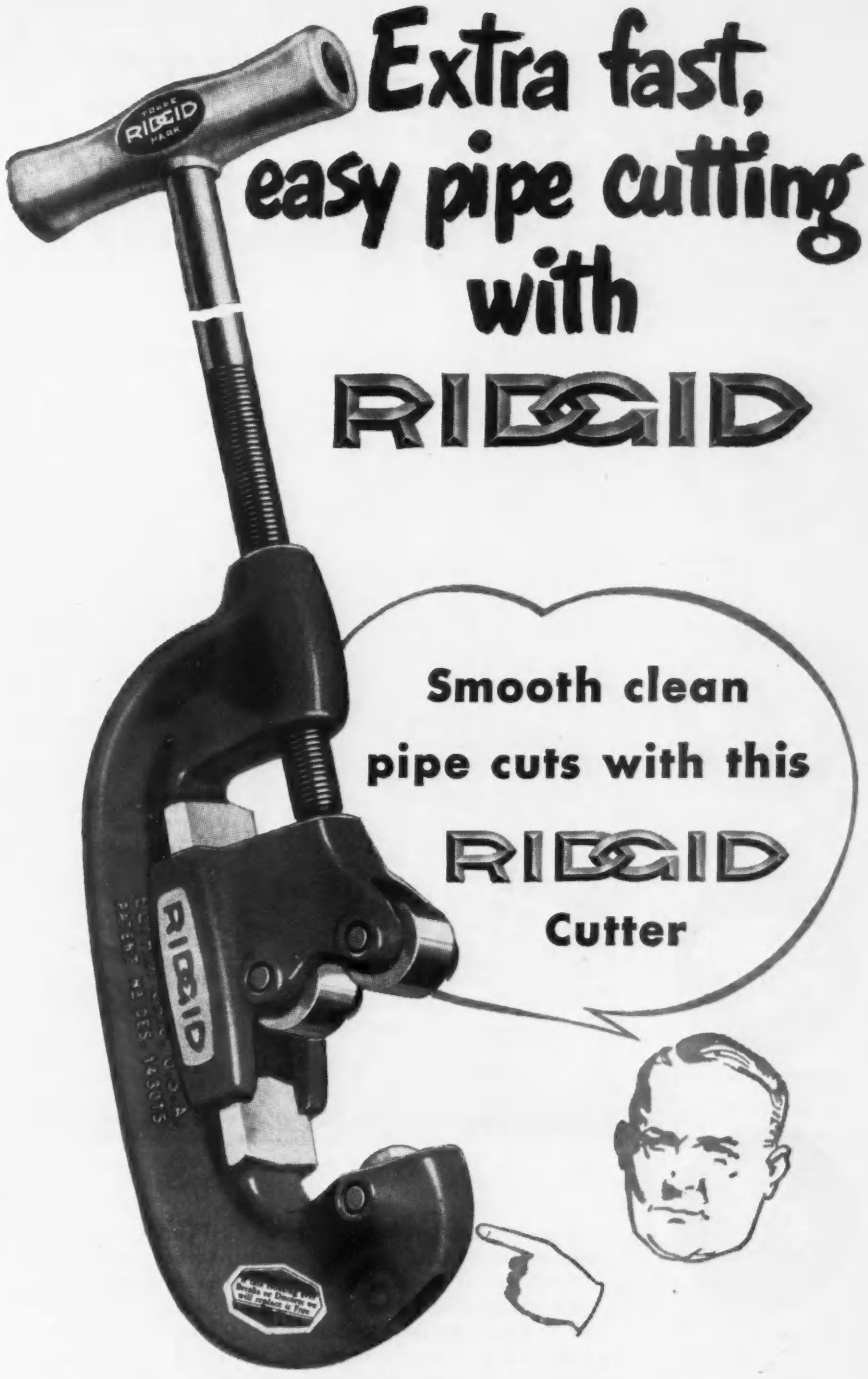
Ben N. Youngken, retired sales manager of the California division, The National Supply Company, died in Los Angeles October 1. A member of Petroleum Pioneers, Youngken retired November 1, 1942 after 43 years with National Supply. He joined Union Tool Company in 1897, and held responsible positions such as superintendent of field operations, sales manager and assistant to the president before Union was consolidated with National. In 1922 Youngken became sales manager of the California division.

•

James C. Roberts, 39, Dallas independent oil operator, died November 3 as the result of injuries suffered in an automobile accident near Lawton, Okla.

•

A. A. Viersen, 90, pioneer Oklahoma operator and an associate of Viersen and Cochran, died November 12 at Okmulgee, Okla. He was active in the oil business up to the time of his death.



• It rolls right through any pipe with least effort, quick almost burrless cuts—factory tested, tracks perfectly. Special thin-blade cutter wheel for extra fast cutting—or heavy-duty wheel for extra long service. Guaranteed warp-proof special malleable housing. Five models to 6" pipe; 4-wheel short-handle models for speedy cutting in tight places. For tops in clean easy pipe cutting, buy RIDGID Cutters at your Supply House.

RIDGID

★ Work-Saver Pipe Tools ★

THE RIDGE TOOL CO. • ELYRIA, OHIO

for SAFE, SURE SERVICE SPECIFY CHIKSAN

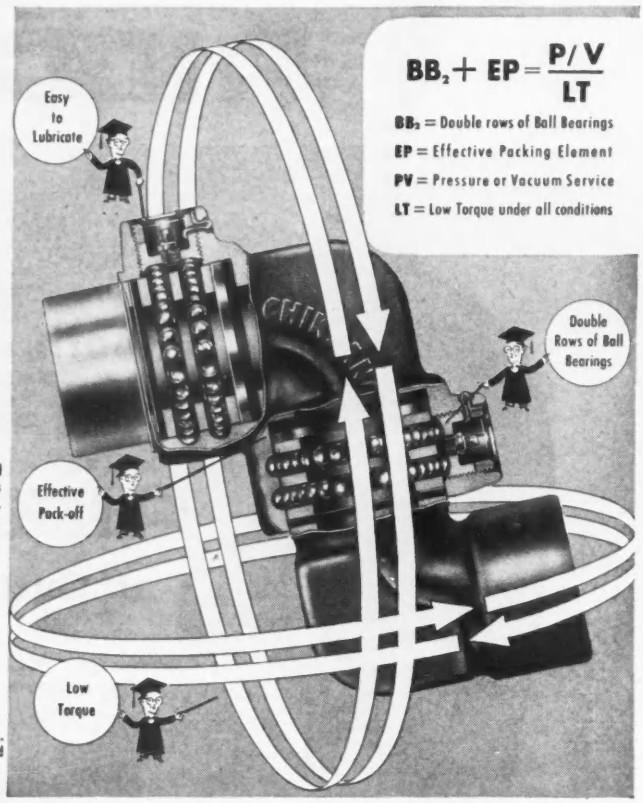
Standard Swivel Joints. For pressures from 125 psi. to 15,000 psi.

High Temperature Swivel Joints. For temperatures to 500°F. M.W.P. 700 psi.

Rotating Joints. For 150-lb. steam, brine, etc. Adapted for siphon return line.

Sanitary Swivel Joints. For Food Processing, Dairies, Bottlers, etc.

Hydraulic Swivel Joints. For pressures to 3,000 psi.


$BB_2 + EP = \frac{P/V}{LT}$
BB_2 = Double rows of Ball Bearings
EP = Effective Packing Element
PV = Pressure or Vacuum Service
LT = Low Torque under all conditions
Easy to Lubricate
Double Rows of Ball Bearings
Effective Pack-off
Low Torque

For over a quarter-century, here at CHIKSAN, we have specialized *exclusively* on developing and designing Swivel Joints* for all purposes . . . on manufacturing them to our rigid standards of precision . . . and on following through in the field to check performance under all sorts of conditions. That's why there is no substitute for CHIKSAN *Ball-Bearing* Swivel Joints* when it comes to efficient service with maximum safety . . . longest life . . . and minimum maintenance.

It costs you nothing to take full advantage of CHIKSAN's *specialized* experience. CHIKSAN Engineers will gladly cooperate with you in designing flexible lines to meet your specific requirements.

WRITE FOR CATALOG NO. 50-C. REPRESENTATIVES IN PRINCIPAL CITIES—SOLD BY LEADING SUPPLY STORES EVERYWHERE

*For full 360° rotation in 1, 2 and 3 planes. Unlimited flexibility in pipe lines is secured merely by arranging swivels in proper sequence. Over 500 different Types, Styles and Sizes for pressures to 15,000 psi; temperatures to 500°F.; pipe sizes from ⅛" to 12" and larger.

CHIKSAN TRADE MARK

CHIKSAN COMPANY

AND SUBSIDIARY COMPANIES

Chicago 3, Ill. BREA, CALIFORNIA Newark 2, N. J.

WELL EQUIPMENT MFG. CORP. HOUSTON 1, TEXAS

CHIKSAN EXPORT CO. BREA, CALIFORNIA NEWARK 2, N. J.

BALL-BEARING SWIVEL JOINTS FOR ALL PURPOSES

Companies in the News

INTERSTATE OIL PIPE LINE COMPANY has consolidated its Tulsa and Shreveport organizations. General offices have been transferred from Tulsa to the Interstate Building in Shreveport, and the various staff and corporate functions which have heretofore been duplicated in the two divisional organizations are now integrated at the new office. The two-division organization is being retained, however, for operation of the crude pipe line system.

Tulsa is operating headquarters of the Northern division, which includes Oklahoma, Illinois, Montana and Wyoming. The Southern division, Shreveport, includes properties in Arkansas, Louisiana and Mississippi.

Heading the general office and corporate staff in Shreveport is **Joseph L. Seger,** former Tulsan who was elected president on July 1. Assisting Seger in an advisory and consulting capacity will be **Smith W. Day,** Shreveport, vice president and veteran of 46 years' service with the company, who has been serving as head of the Southern division.

Other members of the corporate staff include **P. H. Hunter,** secretary-treasurer; **J. W. Cason,** comptroller; **Sequoyah Brown,** employe relations manager; and **Dr. R. M. Adams,** medical director. All members of the corporate staff will be headquartered in Shreveport.

Operations of the company's pipe line facilities will be in charge of Vice President **Bruce Ramsey,** former head of the company's Northern division organization, who will now be vice president and general manager in charge of operations.

Ramsey's staff will include **H. P. Hellinghausen** as manager of material; **E. M. Henderson,** chief engineer; and **W. F. Davis,** traffic manager.

General supervision over the operations of the two divisions will be exercised by two division managers. **J. M. Bradley,** former operations assistant to the president, will serve as manager of the Northern division and will maintain headquarters in Tulsa. The Northern division staff in Tulsa, composed of approximately 20 employes, will include **George Randels,** former northern division general superintendent who has been on loan to Interprovincial Pipe Line Company, as assistant division manager; **S. C. Phelps,** former northern division engineer and acting general superintendent, as division engineer; **Noble F. Jones,** division employe relations manager, and **Leo F. Haas,** former northern division chief accountant, as division chief clerk.

Southern division operations will be in charge of **S. R. Simmons,** former assistant manager and general superintendent of the Southern division, who will be division manager. Simmons will have two assistant division managers; **S. A. Sheppard,** former assistant general superintendent of the Southern division; and **Joe C. Rawlins,** former assistant to the Southern division general manager.

•

SOCONY-VACUUM OVERSEAS SUPPLY COMPANY, a new subsidiary of Socony-Vacuum Oil Company, Inc., has opened offices at 158 Linwood Plaza, Fort Lee, N. J. The new company will centralize the handling of several aspects of Eastern Hemisphere operations which were divided among various departments of the parent company. **Robert Siegel** has been named president.

Associations

T. E. Graham of Oklahoma Gas and Electric Company, newly elected president of Petroleum Electric Power Association, at left, congratulates R. E. Patrick of Kansas Gas and Electric Company, outgoing president, on his work in promoting cooperation between oil companies and power companies. At Graham's left are James E. Moody of Southwestern Gas and Electric Company, new association secretary-treasurer, and Ned W. Beaudreau of Central Power and Light Company, vice president.

PEPA Urges Cooperation of Consumers, Power Suppliers

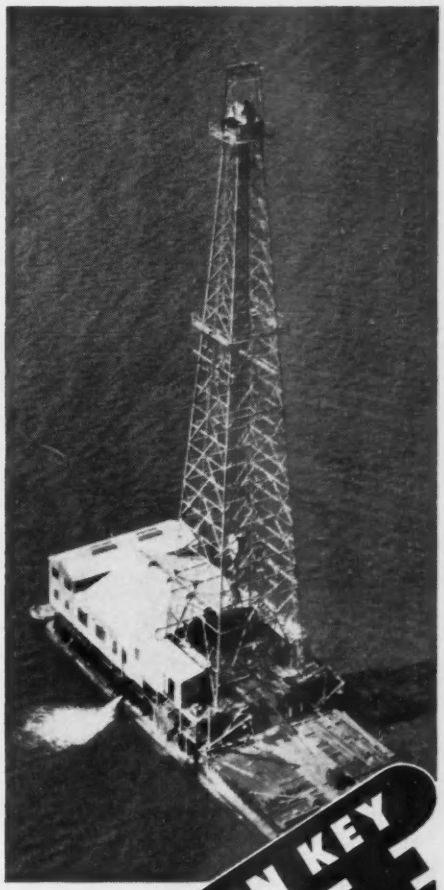
Promotion of greater cooperation between oil and gas companies and the power firms which serve them was the theme of the 23rd annual meeting of the Petroleum Electric Power Association in Houston, November 19-20.

Papers presented included "Operational Advantages in Using Electric Power for Pumping Oil Wells," by A. S. Ross, vice president of Caddo Oil Company; "Why Power Companies Should Promote Corrosion Control," by H. H. Anderson, vice president of Shell Pipe Line Corporation; "Distribution and Control of Power for Oil Field Pumping," by C. R. Olson, Westinghouse Electric Corporation; "The Disposal of Salt Water in the East Texas Oil Field," by W. S. Morris, vice president of East Texas Salt Water Disposal Company; and "The Economics of Water Flooding in Texas' Oldest Commercial Field," by W. S. Guthrie, vice president of Coffield-Guthrie, Inc.

At a banquet in the Shamrock Hotel which climaxed the session, Paul Weaver, Gulf Oil Corporation geologist, Houston, discussed the effects of population and industrial shifts which have occurred in the last ten years.

TIPRO Leader Foree Accepts PAD's Top Production Post

R. L. (Bob) Foree, Dallas, president of the Texas Independent Producers and Royalty Owners Association, has accepted the post of director of the Production division of the Petroleum Administration for Defense. He will replace R. G. (Dick) Lawton, effective January 1.



LET
Levingston
DO THE COMPLETE JOB
with the
machinery
of your choice

From crown block to barge bottom, Levingston is prepared to accept the entire responsibility of constructing and rigging-up your submersible drill barges on a turn-key basis. You select the tools or equipment, and Levingston's experienced organization will install them for safe and efficient operation on marine locations.

Levingston
SHIPBUILDING CO.
Orange, Texas

best anywhere

McGOWAN

self-priming centrifugal pumps for oil field jobs

Here is the outstanding pump in its field. It is designed, engineered and constructed with McGOWAN "know-how". Now in operation in oil fields all over the world. All welded steel design for greater strength and lighter weight.

Features include automatic priming, non-clogging impeller, hardened wear plates, large access plates, tested and trouble-free shaft seals.

See your Supply Co. or call direct. FREE CATALOG on request to: Dept. A, McGowan Pump Division, Leyman Mfg. Corp., Central Ave., Cincinnati, Ohio.

SINCE 1852 McGOWAN PUMPS

McGOWAN PUMP CO.
CINCINNATI, OHIO

division of
LEYMAN
MANUFACTURING
CORPORATION

ASSOCIATIONS

TGT President Will Address Pipe Line Contractors Meet

Gardiner Symonds, president of Tennessee Gas Transmission Company, Houston, will be the principal speaker at the fourth annual convention of the Pipe Line Contractors Association, to be held at the Shamrock Hotel, Houston, January 8-9.

Forty-three pipe line contracting firms comprise the active membership of the association, which is headed by President L. H. Favrot, Houston Contracting Company.

Program chairman for the annual convention is James P. Neill, Western Pipe Line Constructors, Inc.

About 500 people are expected to attend the meeting.

Conservation and Depletion Will be Discussed by IOCC

Clarence T. Smith, of Flora, Ill., will discuss "Conservation Aspects of the Depletion Clause" before the Winter (Annual) Meeting of the Interstate Oil Compact Commission to be held in Little Rock, Ark., December 11-12, with headquarters in the Marion Hotel.

Smith, an attorney and independent oil operator, was appointed Illinois representative to the IOCC in June of 1946 by the former governor of Illinois, Dwight H. Green. He was subsequently reappointed to this post by the present governor of the state, Adlai E. Stevenson, and served in this capacity until September of this year, when he was succeeded by Guy McGaughey, a Lawrenceville, Ill., attorney. Smith had previously served as Governor Green's representative for approximately two years during 1941-1943.

Smith has always taken an active and personal interest in Compact affairs, and, as Illinois representative, has been a member of the Compact's Executive Committee for many years.

Committeemen Are Appointed For API Mid-Continent Meeting

Henry E. Miller of Globe Oil & Refining Company, chairman of the General Arrangements Committee of the Mid-Continent District, API Division of Production, has appointed five major committee chairmen to complete plans for the spring meeting March 19-21 in Wichita, Kansas.

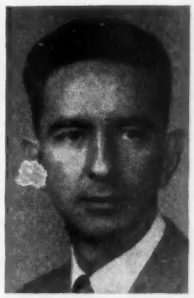
Leo Ross, Lario Oil & Gas Company, is vice chairman of general arrangements. Named chairman of the Registration Committee was V. J. Mercier, Wichita, Perforating Guns Atlas Corporation, with Jack Worley, Independent Oil & Gas Service, vice chairman. Worley is also chairman of the Publicity Committee. Assisting him are vice chairmen Sam Keifner, The Wichita Eagle, and Ted Brooks, The Wichita Beacon.

Marvin D. Rasher, Cardwell Manufacturing Company, is chairman of the Entertainment Committee. Vice chairmen are Mood Harrell, The Texas Company, and Jake Easton, National Tube.

The Housing Committee is headed by F. W. Heiser, Derby Oil Company, with Lloyd Clothier, Franco-Central Oil Company, as vice chairman. G. C. MacDonald, Gulf Oil Company, Tulsa, is chairman of the Program Committee, and John P. Roberts, assistant conservation director, is vice chairman.

Illinois Oil and Gas Society Names Executive Secretary

Charles J. Pardee has been appointed executive secretary of the Illinois Oil and Gas Association to succeed John E. Miller, resigned.



Charles J. Pardee

Pardee attended Southern Illinois University, Ohio State University, and the University of Chicago. He is a veteran of four years in the Air Force. Before his present appointment he was sales manager of Mid-State Chemical Company, and prior to that had been executive assistant to the principal of Mt. Vernon, Ill., High School.

Southwest Oil Laws Meeting Scheduled for January 17-19

Unit agreements and unit operations, a field that is rapidly gaining in importance among the oil and gas producing states, will be the subject of the Third Annual Institute on the Law of Oil and Gas and Taxation. The meeting, which is sponsored by the Southwestern Legal Foundation, will be held in Dallas January 17-19.

The Institute will deal with the engineering aspects of unit operation; content of the royalty owner's and operator's unit agreement; antitrust and other statutory restrictions on unit agreements; rights and remedies of the lessor and royalty owner under a unit operations; the problems of the tract which partially agrees to unit operation and the tract which refuses to consent to unit operation; unit operation of public lands; the negotiation and execution of a voluntary unit agreement and compulsory unit operation, procedure, proof, validity and legal effect.

Tax specialists will also discuss the tax aspects of many oil and gas transactions as well as those arising out of the unit operation.

Western High Jinks Slated December 12 in Los Angeles

The Wildcat Committee of the Western Oil & Gas Association has completed plans for the annual oil men's High Jinks, which this year will take place in the Biltmore Hotel, Los Angeles, December 12. Henry Salvatori, president of Western Geophysical Company, is chairman of the committee.

Maurice A. Machris, executive vice president of Wilshire Oil Company, is vice chairman; Stan Natcher, assistant to the vice president, Standard Oil Company of California, is treasurer; and Ken Faulkner, assistant division manager of sales promotion, The Texas Company, is secretary.

Economics Committeeman

E. M. Borger, president, Peoples Natural Gas Company, Pittsburgh, has been appointed chairman of the Committee on Economics of the American Gas Association, it was announced by George F. Mitchell, president, The Peoples Gas & Coke Company, Chicago, and new president of AGA.

FLY C&S direct to

CHICAGO & SOUTHERN AIR LINES

VENEZUELA!

CUBA — JAMAICA

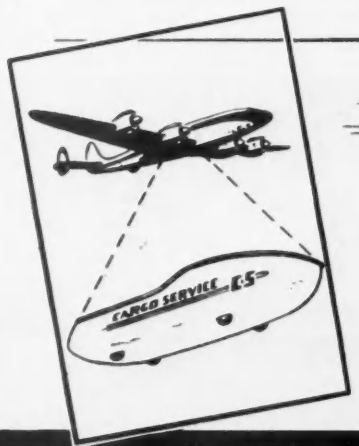
via

NEW ORLEANS GATEWAY

Flights each way Every day!

Fastest daily service from the Southwest! C&S new luxury Constellations offer 300-m.p.h. pressurized cabin service to the oil fields of Venezuela and South America through the New Orleans gateway. One carrier service from Houston, St. Louis, Chicago and Detroit, with connections at New Orleans to and from New York, Dallas, Tulsa, Los Angeles and San Francisco. For reservations call the nearest C&S ticket office or your Travel Agent.

C&S NEW LUXURY CONSTELLATIONS OFFER FASTEST SERVICE BETWEEN HOUSTON-CHICAGO; HOUSTON-DETROIT; NEW ORLEANS-DETROIT



SHIP

C·S SPEEDPAK

Large SPEEDPAK units, carrying as much as most two-engine cargo planes, are attached to the 300-mile-per-hour C&S CONSTELLATION . . . providing a lower deck exclusively for cargo. C&S is the *only* air line operating SPEEDPAK service to Cuba, Jamaica and Venezuela!

CHICAGO & SOUTHERN AIR LINES

OFFICES IN PRINCIPAL OIL CENTERS IN THE UNITED STATES

EQUIPMENT AND SERVICE SUPPLIERS' NOTES

THE FIRST INTERNATIONAL SALES CONFERENCE held by Chiksan Company was attended by all Chiksan salesmen and commission representatives, as well as delegations from the company's two subsidiaries, Chiksan Export Company of Brea and Well Equipment Manufacturing Corporation of Houston. The 60 men present discussed new Chiksan equipment, including a metal rotary hose for use on jackknife rigs. Pictured are, first row (kneeling): Art Edwards, Sam Blue, Ed Leicester, Elmer Rhodes, Bill Clark, Carl Gast, Frank Wiegand, Bob Perry, Ed Richard, Ed Miller, Floyd Ferguson, Chuck Russell, Joe Schlarb, Ed Landgraff, and Dale Prentice. Second row: Ed Myers, John Rittelmeyer, Harry Rogers, John Gates, Doyle Warren, Bill Connelly, Frank Burrill, Dick Winder, Stew Miller, Frank Land, Mac McCelvey, Nate Zimmerman. Third row: Lee Guill, Al Neely, Hal Stock, Bev Ragsdale, Chub Morrison, Robby Robinson, George Beecroft, Roy Shields, Durk Durkin, Hank O'Breen, Ed Vance and Lou Smith. Fourth row: Walt Berntsen, Rollo Stover, Art Stoeltzing, Moff Moffitt, John Schmidt, Bob James and Bill Cone. Fifth row: Doc Brill, Kenny Knutzen, Neil Thomas, Bob Jones and Pete Bily. Back row: Gus Bagnard, Chuck Holcomb, Bernie Coane, Foster Jordan and George Cousins. Attending, but not in picture, were Don Jackson, Roy Irvin and Howard Dickson.

H. C. Price Company Promotes White To Manager of Somastic Operations

R. P. White, veteran Gulf Coast Somastic manager for H. C. Price Company, has been named manager of the company's coating operations in the 37 states east of the Rocky Mountains, according to an announcement by J. S. Dewar, Somastic division vice president.

White's promotion followed the recent resignation of E. Rowland English, East Coast Somastic manager, who left the company for a position with another pipe coating firm.

Coincident with the promotion of White, the following changes in HCPCO's Somastic division were also announced: Gulf Coast division—H. N. VerSoy named manager; Leo C. Carle, named assistant manager. East Coast division—Montie J. Lane named manager; Troy L. Huitt, named assistant manager; and C. V. Johnson placed in charge of sales.

White's career in Somastic, which began in 1940, was interrupted for several years by wartime duty in the navy. He has been in charge of Gulf Coast operations since a permanent Somastic plant was located at Harvey, La., in 1949. In his new position, White will operate out of Price's headquarters in Bartlesville.

Camco President Recuperating

Paul R. Mills, president, Camco, Inc., Houston, is recovering from the serious automobile accident he experienced August 10 near Douglas, Wyo. While Mills is still troubled with an injured shoulder and a crushed spine, he is expected to be back on the job in a few months.

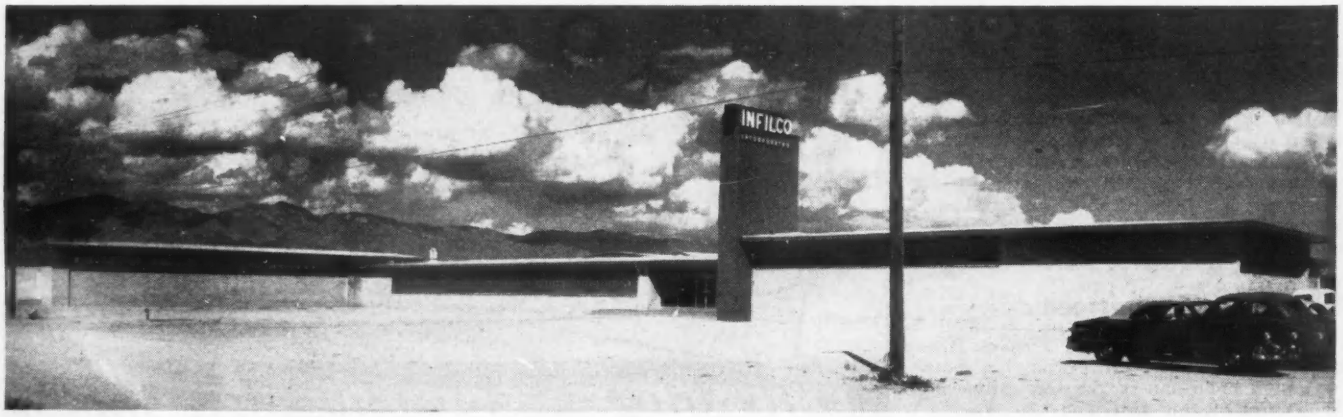
A. O. Smith Corporation Expands Welding Products Sales Promotion

J. W. Spoor has been named general sales manager of the Welding Products division of A. O. Smith Corporation at Milwaukee.

L. F. Vonier, former sales manager, is now sales promotion manager and will assist Division Manager L. T. Hickey and Spoor in expanding A. O. Smith's sales of both welding electrodes and welding machines.

Spoor was formerly manager of A. O. Smith's Product Service division. Before that he was assistant to the vice president in charge of sales at Brunswick-Balke-Collender Company, Chicago.

Succeeding him as Product Service division manager is Charles Smith, formerly field service manager.



INFILCO INCORPORATED has moved into this new research and executive headquarters building at Tucson, Ariz. The $600,000 plant, set on a 7½-acre plot, has 40,000 square feet of floor space. It will house the Engineering, Research and Development divisions, as well as home sales and executive offices. P. N. Engle is Infilco's president.

EQUIPMENT and SERVICE SUPPLIERS' NOTES

Halliburton Promotes Peterson to Assistant General Credit Manager

Halliburton Oil Well Cementing Company has advanced J. P. (Pete) Peterson from eastern credit manager to assistant general credit manager. The new position brings Peterson from Flora, Ill., to Halliburton's Duncan, Okla., headquarters.

J. P. Peterson

Lester S. Dunlevy, formerly fieldman at the Olney, Ill., camp, succeeds Peterson as eastern credit manager.

Peterson has been with Halliburton 11 years. From 1940 to 1947 he worked in Gulf Coast operations, transferring to the Eastern division in 1947.

Welex Jet Elects R. H. McLemore Executive Vice President-Manager

Robert H. McLemore of Welex Jet Services, Inc., Fort Worth, has been elected executive vice president and general manager of the firm. He was formerly vice president of operations. Before joining Welex in 1945 McLemore was district engineer for Sun Oil Company in Dallas.

R. H. McLemore

Sterling Holloway, Fort Worth, president of Continental Life Insurance Company, was elected a director of Welex.

Marketing Research Manager Named By Worthington Pump and Machinery

J. B. Laramy has been appointed manager of the Marketing Research department of Worthington Pump and Machinery Corporation, Harrison, N. J.

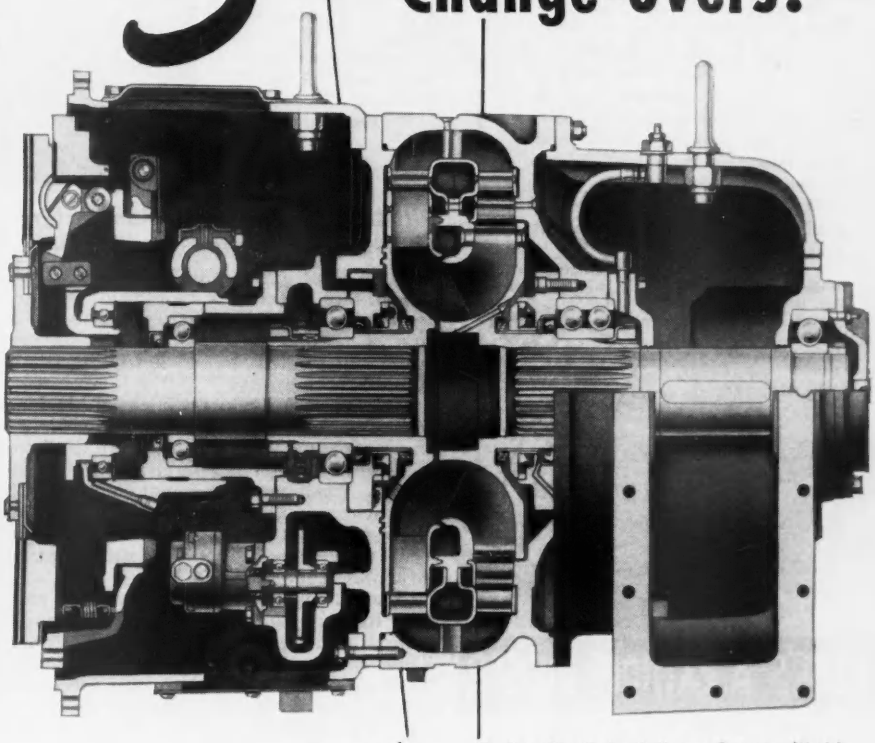
J. B. Laramy

The post of assistant manager of the Chicago district office, formerly held by Laramy, has been filled by J. T. Carroll.

Laramy was graduated from the University of Michigan with a B.S. degree in mechanical engineering in 1929. He took the Worthington Student Training Course and became an estimator and then a general line salesman in the Chicago district office. In 1945 he was named assistant district office manager.

Carroll was graduated from Northeastern University with a mechanical engineering degree in 1926, and joined Worthington in 1931. For the past three years he has been regional distributor supervisor for the Air Conditioning and Refrigeration division at Chicago.

Save 3 out of 4 Change-overs!



The Twin Disc Hydraulic Torque Converter (Model CF, clutch-type) rides tight herd on the pump to maintain "sock" four times as far.

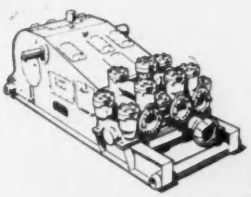
Your mud pump can go down almost *four times as far* WITHOUT changing pistons and liners when power is delivered through a Twin Disc Hydraulic Torque Converter.

The converter automatically adjusts engine torque to compensate for the higher compressions at greater depths. The engine operates at its most efficient horsepower, the pump automatically adjusts itself to maximum discharge volume.

Moreover, torque converter operation levels out fluid pressure pulsations . . . "rides tight herd" on the pump not for a few feet, nor for 1,000 feet, but all the way for as much as four times that far per changeover.

That's why you get double savings: Faster finish for each job, and more efficient use of expensive manpower and machinery.

Twin Disc Hydraulic Torque Converters belong on any job where steam-smooth performance is an advantage. For these converters provide, automatically, "soft but firm" operating characteristics by multiplying engine torque as much as five times. Ask for Bulletin 135-D, or see your nearby Twin Disc representative.



TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES
REG. U.S. PAT. OFF.

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

BRANCHES: CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEWARK • NEW ORLEANS • SEATTLE • TULSA

STEEL Kelley PRODUCTS

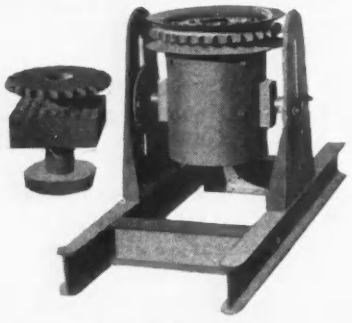
Do You Need a Good New Source of Metal Stampings for Defense Contracts?

Kelley has the facilities, the know-how, and the men to do your job and to do it right. From start to finish Kelley is your one source—to help you engineer stampings, to design and make the tools, and, most important, to deliver the job to your specifications on time. Kelley cut its teeth in oilfield equipment, uses that experience to make your job better.

Write for this booklet, a complete description of Kelley, shows work done, lists machines, shows how Kelley will help you.

Kelley
MANUFACTURING CO.
4800 Clinton Drive P. O. Box 17
Houston, Texas

HERE'S A RATHOLE DIGGER



To save you TIME AND MONEY

It's actually a tilting, "baby" rotary, skid mounted and driven through the regular rotary table . . . and it gets those ratholes down in less time than it takes to jack up and re-set the big table. Available in three sizes, for digging ratholes up to 13" O.D., BEMCO Rathole Diggers are fully portable, easily moved from one rig to another. Regular square or fluted kelly's are used, with drive bushings furnished to specifications.

BUY BEMCO Rathole Diggers . . . one for each area in which you're operating . . . and you'll be money ahead after the first few holes.

L&H MACHINE WORKS
2205 Quitman Houston, Texas
EXPORT: Baird Supply Co., Inc.
420 Lexington Ave., New York, N. Y.

TOP STATE officials were on hand at the recent dedication of Rockwell Manufacturing Company's new plant in Tupelo, Miss., to greet management people who came in from Pittsburgh. Left to right are Governor-elect Hugh L. White, Governor Fielding Wright, H. Campbell Stukeman, vice president, and Col. W. F. Rockwell, chairman of the board.

Pittsburgh Firm Begins Manufacture Of New "Throwaway" Drilling Bits

Mackintosh-Hemphill Company, Pittsburgh, has entered a new field of steel manufacture and is currently producing a line of forged steel rock bits which are being distributed by a newly-organized subsidiary company.

Col. James S. Ervin, president of Mackintosh-Hemphill, announced the formation of the company's Drill Bit and Tool division. This new division is charged with the research, development and manufacture of a line of disposable rock bits. These bits are being manufactured in a new building adjacent to the company's Midland Plant at Midland, Penn.

The sale of the "DBT Throwaway" rock bits through contractor and mine supply houses is the responsibility of Drill Bit and Tool Company, a newly-organized Delaware corporation and a wholly owned subsidiary of Mackintosh-Hemphill Company. Officers of the parent company have similar responsibilities in the subsidiary sales firm.

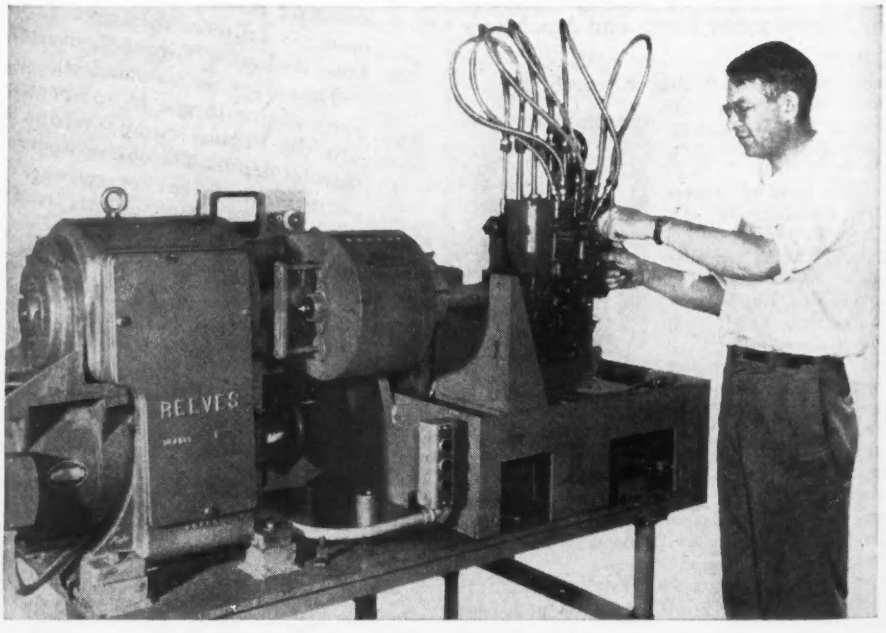
The new rock bits are manufactured and distributed under a license agreement. Drill Bit and Tool Company will sell the new product throughout the U. S. and South America.

Cummins Engine Standardizes Method Of Testing Fuel Pumps for Diesels

Research by Cummins Engine Company, Inc., at Columbus, Ind., has resulted in a method of standardizing Cummins diesel fuel pump testing equipment and testing procedures, and the method is now being used by Cummins dealers.

Hydraulic characteristics may differ between fuel pump test stands and sometimes cause variable quantities of fuel to be delivered by the same pump when tested on different stands. "Cummins is now aiming at standard servicing methods and test procedures in order to assure Cummins users comparable results," according to Harold H. Hall, Cummins general service manager.

The new factory at Midland has been equipped with forging and high frequency induction heat treating equipment, plus facilities for the manufacture of forging dies and other wearing parts.



Testing of fuel pumps used on the Cummins fuel system has been standardized by development of a new fuel pump test stand by Cummins Engine Company. Here, J. Elwin Gates, Cummins laboratory technician, makes a final adjustment on a Cummins DD fuel pump prior to the start of a series of standard tests.

EQUIPMENT and SERVICE SUPPLIERS' NOTES

Schlumberger Corporation Opens Service Centers in Three Areas

Schlumberger Well Surveying Corporation has added three new locations to its list of service centers.

J. E. Young

Moving into the Williston Basin, the company has set up an office at Williston, N. D., under the management of J. E. Young. Young, a Schlumberger employe since January, 1948, has worked in Montana and Wyoming.

A center at McCamey, Texas, was opened, with D. M. Quillan in charge. Quillan has been with the firm since February, 1949, serving in the Permian Basin area.

In the Rocky Mountain region, a new station has been established at Vernal, Utah. John Rusen, an employe since February, 1948, was transferred from Casper, Wyo., to take charge at Vernal.

Baash-Ross Names Kenneth S. Ross To Head Export Sales Department

Baash-Ross Tool Company has appointed Kenneth S. Ross, formerly with the California division, to head the company's Export Sales department in New York City. His offices are at 11 West 42nd Street, where all Baash-Ross Export operations are centralized.

K. S. Ross

After an extensive period of field work with a major drilling contractor, Ross joined the Baash-Ross organization at the Los Angeles plant. He worked up through various departments, then was transferred to the Bakersfield and San Joaquin Valley, where he was before his recent promotion.

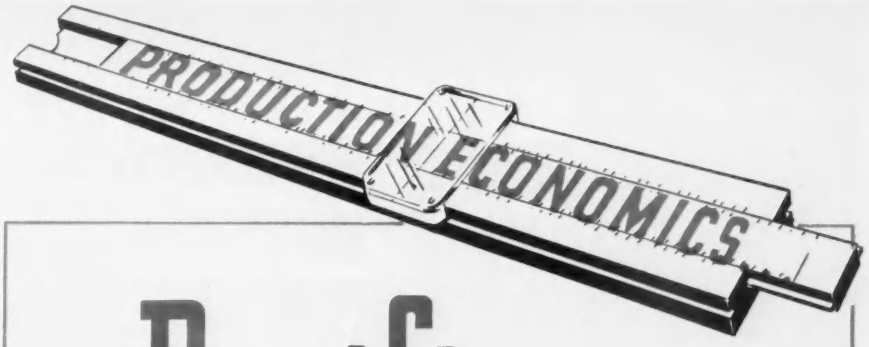
Baroid Sales Opens Headquarters And Plant Building in Houston

Baroid Sales Division, National Lead Company, was host to several hundred guests from the Southwest area when it opened its new administration building and plant at 2404 Danville in Houston.

The F-shape buiding is two-story, and extends 224 feet across the front and 135 feet deep. Offices, well logging, divisional laboratories, service and shipping departments are on the first floor. Research laboratory, accounting and special offices are on the second floor.

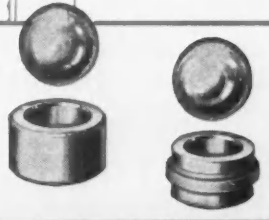
J. A. Martino of New York, president of National Lead, attended the opening. George L. Ratcliffe is Baroid's general manager.

Executive offices were formerly in Los Angeles.



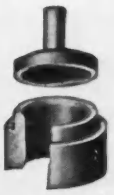
by Pacific PUMPS INC.

	QUESTION		ANSWER
Q	*Why is oil at the bottom of the well like money in a safe deposit box?*	A	Because it is a LIQUID ASSET IN DEAD STORAGE WITHOUT EARNING POWER.
Q	*Can this condition be changed?*	A	Yes — both can be activated and given earning power.
Q	*How can they be activated?*	A	Draw some of the money from the safe deposit box — purchase and install a Pacific Oil Well Plunger Pump in the well — pump the oil to the surface. MONEY IN CIRCULATION — OIL IN CIRCULATION — BOTH WITH POWER TO EARN.
Q	*Why purchase and install Pacific Oil Well Plunger Pumps?*	A	Because only Pacific gives you the EXCLUSIVE MOLOY® LINERS with the strength, toughness, hardness, combined with greater resistance to temperature, corrosion and abrasion essential for long, economical life.



Plungers — Chrome-Plated then Pacilited for extra wear life.
Valves and Seats — To fit well conditions.
Extra Heavy Seats — Resist hammering of ball with less chance of distortion.

PACIFIC *Precision Built* PUMPS

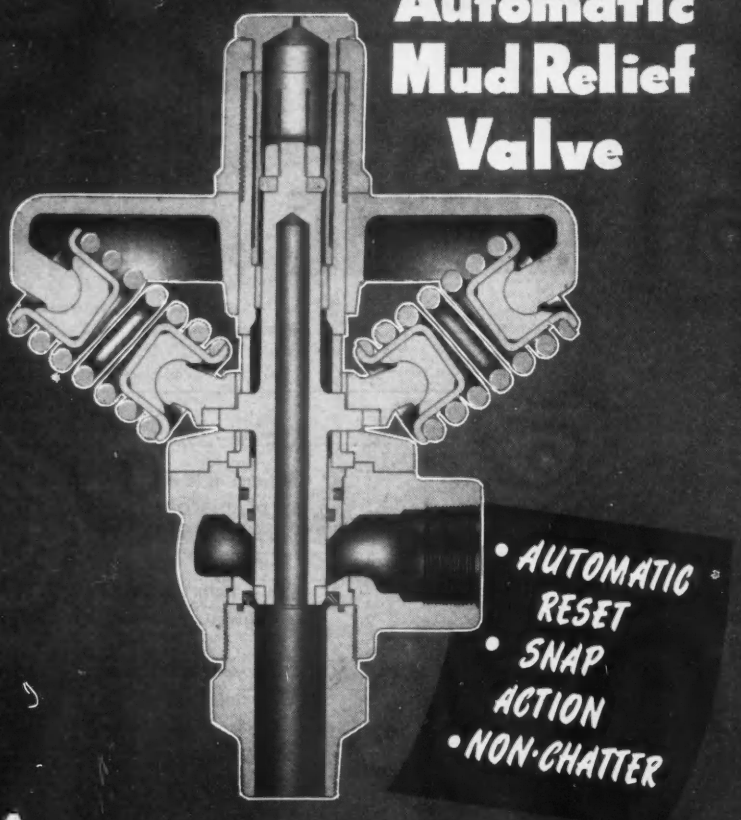


DW-6

Pacific Pumps inc.
ONE OF THE DRESSER INDUSTRIES

HUNTINGTON PARK, CALIFORNIA
Export Office: Chanin Bldg., 122 E. 42nd St., New York
Offices in All Principal Cities

KINZBACH
Automatic Mud Relief Valve



AT last positive automatic relief of overload pressures in mud lines is possible. The new Kinzbach Model 112 Relief Valve provides safer, more efficient pump or pressure relief and greater flexibility in operations than any other valve.

The Model 112 operates on working pressures from 750 to 2500 p.s.i. It Snaps Open for instantaneous pressure relief at maximum volume. It Snaps Shut to restore circulation instantly and automatically after a pre-determined pressure drop.

The Model 112 Valve can be used for any mud relief application, including compounding operations. Field tests prove conclusively that the Kinzbach Valve offers every operational advantage required for efficient mud operations. Write for full technical data. Ask for bulletin 11250.

KINZBACH TOOL CO., INC.
P. O. Box 277 • Houston 1, Texas

KINZBACH TOOL CO INC

Export Office:
74 Trinity Place,
New York, N. Y.

EQUIPMENT and SERVICE SUPPLIERS' NOTES

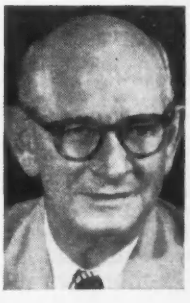
Harold C. Price

J. B. Harshman

H. C. Price Company Marks 30 Years In Field of Pipe Line Construction

From a one-machine electric welding shop to one of the largest pipe line construction firms is the history of H. C. Price Company, Bartlesville, Okla., which in November celebrated its 30th anniversary.

Recognized as an authority on electric welding, Harold C. Price, president of the organization, has built his faith in the merits of this industrial tool into a multi-million dollar construction firm with 20,000 miles of pipe line experience behind it.



J. S. Dewar

Price crews have worked in 33 of the United States, Canada, Alaska, South America and the Middle East, and have been employed by more than 100 different companies.

Following several years as a rod-and-chainman on surveying crews in Colorado, Harold Price entered the Colorado School of Mines in 1909. Four years later, after spending summer vacations working in metallurgical plants and assay laboratories, he was graduated as an engineer of mines.

Price's first job after college was as chemist and engineer for the New Pennsylvania Mines Company at Montezuma, Colo. He later worked at Salida, Colo., for American Metals Company, then went on to Oklahoma where he was superintendent at the zinc oxide plant on the outskirts of Bartlesville, the city where he has since maintained his home and headquarters.

He served in the Coast Artillery in World War I, and upon being discharged as a first lieutenant in 1918, he returned to American Metals as assistant manager of employe relations at Langeloth, Penn., before going back to Bartlesville. Within 18 months after his return to Bartlesville Zinc Company as manager of employe relations, the plant was forced to shut down in the recession of 1921. Price, out of a job, had developed an interest in the technique of electric welding, and opened a shop, the Electra Welding Company, on November 1, 1921.

The meagerly equipped Electra concern was still one of the few electric welding shops in the Southwest. Its first big job was repairing the leaky bottom of a 55,000-barrel storage tank for Empire Pipeline Company in the El Dorado, Kansas, oil field. With this success, the firm name

EQUIPMENT and SERVICE SUPPLIERS' NOTES

was changed to Welding Engineering Company.

In 1928 Price was awarded contract for field welding of a 169-mile stretch of eight-inch oil line from San Augustine to Corsicana, Texas, for Texas Pipe Line Company. When this job was hailed as a success, Price's services were immediately sought on lines throughout the country. By 1929, Welding Engineering Company achieved the position of the largest electric welding contractor in the U. S.

Technical accomplishments such as the shielded arc method, elimination of the backup ring and the "stovepipe" method, have marked Price's development.

The company name was changed in the late 1930's to H. C. Price Company, and a separate company, Industrial Engineering Company, was established in 1936 by Price and W. A. Bechtel Company of San Francisco to manufacture and distribute Somastic coating.

Today the Price company has four spreads of "big-inch" equipment, under the management of Pipe Line division Vice President J. B. Harshman and Manager John M. Thomas. The Somastic division is directed by Vice President J. S. Dewar and Manager R. P. White.

Black, Sivalls & Bryson Appoints Oklahoma City Contract Sales Head

Black, Sivalls & Bryson, Inc., has appointed Lu N. Tidd as manager of contract sales for the Oklahoma City plant.

Tidd has been an officer of the company since 1950, in the capacity of assistant treasurer and assistant secretary. Before his present appointment as manager of contract sales, he was general credit manager for five years.

Lu N. Tidd

Cummins Sales Engineers Appointed To Assistant Regional Managership

R. A. D'Amour

G. W. Plondke

Two sales engineers with Cummins Engine Company, Inc., Columbus, Ind., have been transferred from the factory to Cummins regional liaison offices as assistant regional managers. R. A. D'Amour has been named assistant regional manager, Washington, D. C., and G. W. Plondke has been named to a similar post in the Central region, Chicago.

D'Amour and Plondke started with Cummins in 1948, as trainee engineers, and were made sales engineers in May, 1949.

At this time of year when there

is considerable ringing of chimes

We hasten to send our best wishes for

a merry season and happy times

To all our Correspondent Banking friends in

Oklahoma, Kansas, Arkansas

Texas, Colorado, Missouri

New Mexico and all over the

Middle West

Please accept our greetings and very best

And to all our customers, in Oil, Business,

Manufacturing Retailing

and et cetera (which comprises a large

group of gals and guys)

Here's a "MERRY CHRISTMAS" to try on for size.

In fact, to ALL our customers-yes, You

and You and YOU and YOU

Here's a prosperous '52!

This sentiment is strictly unrehearsed

Our thanks that this year-you thought-FIRST!

THINK 1st of Tulsa

★ In our Correspondent Bank Department, You should know, Elmo Thompson, Joe Byrd, Harry Lane, Bill McLean, and Dick Wagner.

THE FIRST NATIONAL BANK AND TRUST COMPANY OF TULSA

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

Gustin-Bacon Manufacturing Company officials are pictured at the open house celebrating the opening of the sales office and warehouse in Houston. Left to right are C. H. Freeman, office manager, Houston; B. P. Murphy, advertising manager, Kansas City; C. H. Armstrong, vice president industrial sales, Kansas City; D. W. Martin, division manager, Tulsa; J. D. Simmons, executive vice president, Kansas City; G. C. Jordan, general sales, Kansas City; H. M. Stone, branch manager, Houston; E. L. Melton, general purchasing agent, Kansas City; and J. T. Conlon, vice president engineering, Kansas City.

Eagle-Picher Lead Wool

Stops bottom water

Prevent costly shutdowns, keep bottom water out of your wells, with effective, economical Eagle-Picher Lead Wool. The fine, flexible strands fill cracks and crevices with a permanent, non-corrosive seal... save you time and money. Packed in convenient 50-pound sacks — easy to place in special cartridge-shaped Eagle-Picher Wire Containers sized to fit all casings. Order through your jobber.

EAGLE EP PICHER

THE
EAGLE-PICHER
SALES COMPANY
Since 1843
Metallic Products Division, General Office
Box 777, East Chicago, Indiana
Cincinnati · Kansas City · East St. Louis
Dallas · Houston
Member: Lead Industries Association

These **3** *Eagle-Picher Bearing Metals meet most requirements*

1. **Dreadnaught** — for extreme speed and heavy-duty conditions.
2. **Outlasta** — for medium speed and average-load conditions.
3. **Durable** — for low speed and light-duty conditions.

Gustin-Bacon Manufacturing Opens Houston Sales Office-Warehouse

Gustin-Bacon Manufacturing Company, Kansas City, has opened a new sales office and warehouse at 5531 Armour Drive, Houston, to house the Houston division operations of the company's oil field, industrial, fire equipment, insulation and railroad business.

Paul O. Craig

Paul O. Craig has been named Houston division manager, and H. M. Stone, who has been with Gustin-Bacon in Houston for the past 17 years, remains as branch manager.

Craig, the new division manager, has had 16 years' service with the company. During the past 11 years he has been district manager in Fort Worth.

Company executives from Kansas City who attended the opening of the Houston installation were J. D. Simmons, executive vice president and general sales manager; C. H. Armstrong, vice president—industrial sales; J. T. Conlon, vice president—engineering; and L. M. Kelly, secretary-treasurer.

Rockwell Assigns Munn to Nordstrom Oil Field Products Sales Position

Rockwell Manufacturing Company has appointed R. J. Munn as assistant sales manager of oil field products, with offices in Pittsburgh.

R. J. Munn

After three years in the Army Air Corps, Munn studied engineering at Texas A. & M. College. Recently he has been working as a sales engineer of the Nordstrom Valve division of Rockwell's Houston district office, and before that was in charge of the Corpus Christi office for several years. Prior to joining Rockwell he worked as a roughneck in the oil fields and later was with Bethlehem Supply Company.

Munn will assist H. Gottwald, general sales manager of the Nordstrom Valve division.

EQUIPMENT and SERVICE SUPPLIERS' NOTES

A. G. Van Campen

M. G. Daniels

Clark Bros. Company Promotes Three To District Executive Sales Posts

A. G. Van Campen has been appointed district sales manager of the Tulsa Mid-Continent territory for Clark Bros. Company, Inc. In the Chicago area, Robert C. Smith has been named district sales manager and M. G. Daniels has been appointed industrial sales engineer.

Van Campen's past 15 years with Clark include a number of years on experimental and technical work and a special project for the War Department. His sales experience consists of four years in the New York office and more recently as district sales manager in Chicago. In Tulsa, he succeeds George W. Probst, who has been named western regional sales manager.

R. C. Smith

Trained and experienced on heavy construction projects in the Pacific Northwest, Smith also spent several years on the Pacific Coast with a major oil company as a refinery project engineer. During the war, he was with PAW Materials Division. Before joining Clark he was with a major manufacturer of heavy equipment for oil and gas industries.

Daniels, a graduate of the University of Michigan, has had eight years' experience selling compressors, pumps and engines to industrial markets.

First National Bank of Houston Names Dietz to Oil & Gas Division

G. S. Dietz has joined the First National Bank in Houston, according to an announcement by E. M. Reed, vice president. As a member of the Oil & Gas department, he will serve as petroleum valuation engineer. Dietz was formerly a senior petroleum engineer for Stanolind Oil and Gas Company.

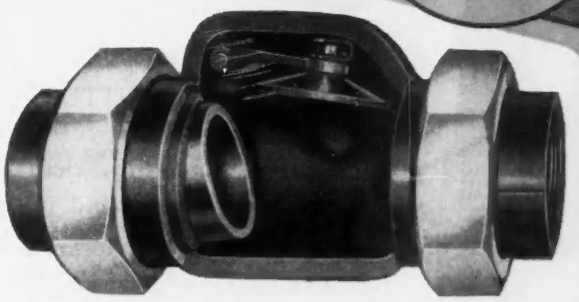
G. S. Dietz

Chiksan Names Eastern Manager

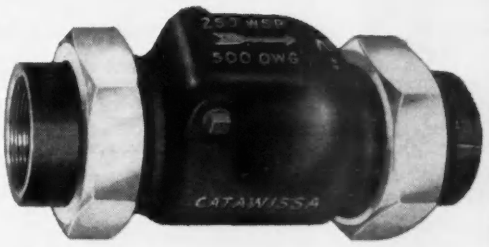
L. J. Smith has been named to the new position of eastern regional sales manager for Chiksan Company, with headquarters in Newark, N. J. Smith was field engineer before his recent appointment.

FLOW LINE AND PIPE LINE TYPE

FULL OPENING FOR 100% UNOBSTRUCTED FLOW!



Here is a FULL OPENING Double Union Swing Check Valve designed and recommended for the rough and ready demands of oil country applications. A compact, efficient, economical, easily accessible unit for use in lines where no stop is installed close to the check valve and where pipe cleaning mechanisms are used. Equipped with Catawissa PERFECT SEAL Unions on both ends!



SIZES: 2" to 4"; Refax Metal bodies, Hitensiloy working parts; 500-lbs. service OWG; 1500-lbs. test; 250 psi WSP

write for CATALOG 11 showing the complete Catawissa line

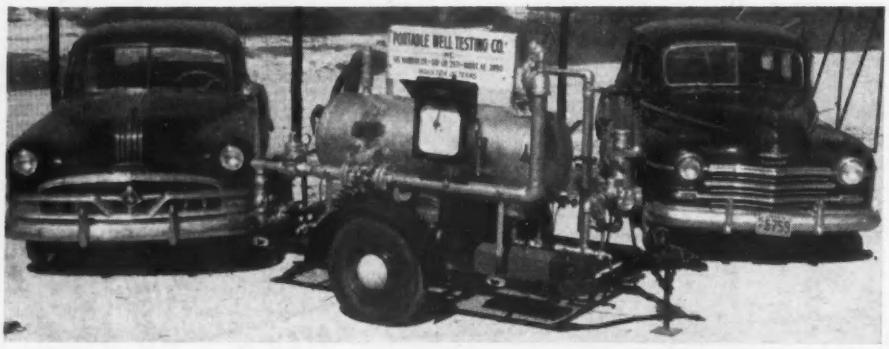
CATAWISSA PERFECT SEAL UNIONS AND VALVES ARE *STOCKED & DISTRIBUTED BY*

OIL WELL SUPPLY CO.

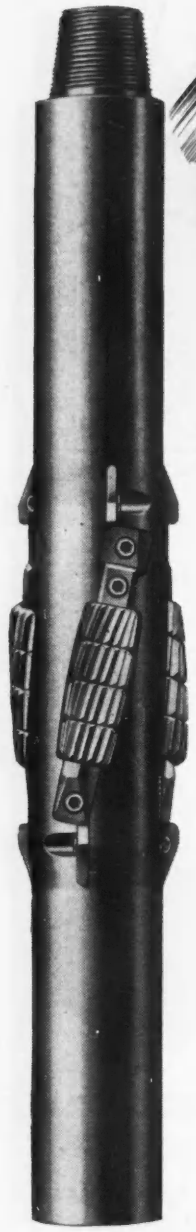
Branches Serving All Oil Fields

CATAWISSA VALVE & FITTINGS COMPANY

60 MILL STREET ★ CATAWISSA, PENNA.



WELL TESTING EQUIPMENT is available on a rental basis from Portable Well Testing Company, Inc., a new firm with headquarters in Houston. Equipment includes a horizontal production separator, with built-in free water knockout and emulsified oil compartments, each compartment with automatically dumped gas-operated floats. Oil and water compartments dump through their respective meters where the flow, in barrels, is measured and recorded; the two streams can then be recombined or run separately to pits or storage. Operations include measurement of self potential, drill stem testing, productive indexes, routine gas-oil ratio determinations, and industrial liquid and gas flow measurements.



GRANT REAMER CUTTERS are angled to the right. Therefore, the Reamer will not thread itself into tight hole, and assures desirable shearing-cutting action as well as round, full-gauge hole.

Now—you get *longer wearing life than ever before* with the Grant Reamer since all parts subject to wear are component parts of the cutter assemblies. Thus, simply changing cutter assemblies renews the entire tool. *No welding is required in the manufacture or maintenance of the Reamer body, eliminating the need for shop repairs.*

Proven Grant Tools—Used Where Performance Counts

Hydrostatic Bailers	Bulletin No. 11
Liner Pullers	Bulletin No. 14
Pressure Releases	Bulletin No. 15
Hydraulic Expansion Casing Scrapers	Bulletin No. 17
Rotary Underreamers	Bulletin No. 24
Cable Tool Underreamers	Bulletin No. 27
Hole Enlargers	Bulletin No. 38
Reamers	Bulletin No. 43-A
Hydrostatic Perforation Cleaners	Bulletin No. 50
Dump Bailers	Bulletin No. 51
Roller Cutter Shale Bits	Bulletin No. 54
Sand Pumps	Bulletin No. 55
Well Cleanout Procedures	Bulletin No. 57
Wall and Bottom Hole Scrapers	Bulletin No. 58
Vertical Casing Scrapers	Bulletin No. 59

Write for Descriptive Bulletins on these Grant Tools

GRANT OIL TOOL COMPANY

Main Office and Plant
2042 E. Vernon, Los Angeles 58, Calif.
Branches Throughout California and The Mid-Continent

Subsidiary: MacClatchie Manufacturing Company

Newman Is Appointed Sales Manager For Gulf Coast Machine & Supply

J. C. Newman has been appointed sales manager for Gulf Coast Machine & Supply Company. Newman has been with the Company since 1937. He went to work in the oil fields as roughneck in 1931, and was later toolpusher. Before joining Gulfco he was with Oil Well Supply Company.

J. C. Newman

The duties of sales manager were formerly handled by Clifford H. LeBlanc, executive vice president and general manager of the company.

Two Houston Assignments Announced By Earle M. Jorgensen Organization

Delmer Q. Bowman, recently appointed manager of Mid-Continent operations for Earle M. Jorgensen Company, has appointed Wilford H. Magee his successor as district manager of the Houston office. James R. Tams has been named assistant district manager in Houston.

Wilford H. Magee

James R. Tams

Magee, who has been with the company since 1936, was named assistant district manager in Houston in November, 1950. He had previously been sales representative in Fresno, Calif.

Tams started with the company in 1947, upon graduation from Pomona College. He has been in Houston 2½ years.

The appointment of Lester B. Tolson as assistant district manager of the Dallas warehouse was also announced. Tolson started with Jorgensen in 1928 and has been chief clerk of the Los Angeles office for the past five years. He attended Southern Methodist University and Texas A. & M. College.

EQUIPMENT and SERVICE SUPPLIERS' NOTES

M. L. Walraven, Jr.

W. R. Foster

Byron Jackson and Specialty Sales Sign Agreement on Dempsey Pumps

Byron Jackson Company announced that an agreement has been reached with Specialty Sales and Service, Inc., Tulsa, whereby that firm will handle all sales of the Dempsey hydraulic oil well pump as the exclusive sales agent for Byron Jackson Company, Dempsey division, in the Mid-Continent area.

This agreement permits Specialty to continue to perform a service that it had done as representative of the Dempsey Pump Company of Tulsa prior to the recent purchase of that firm by Byron Jackson.

Specialty Sales is headed by M. L. Walraven, Jr., president, and W. R. Foster, vice president.

Specialty plans to undertake an expansion program to serve all active areas in Texas, Oklahoma, Kansas and other Mid-Continent oil-producing states. The first step in this program was taken with the opening of an office in Fort Worth, headed by Foster. H. W. Wood continues in charge of the company's office in Odessa, Texas.

Chemical & Geological Labs Open Midland Core Analysis Facilities

Chemical & Geological Laboratories, Casper, Wyo., has established a laboratory and office in Midland, Texas, to serve the Permian Basin with full diameter and routine core analysis. The new branch, at 1700 West North Front Avenue, is under the management of Richard L. Brown, who was transferred from the Chemical department in Casper.

Richard L. Brown

E. R. English Named Vice President Of Pipe Protection Organization

Pipe Protection Service, Inc., Elizabeth, N. J., announced that E. Rowland English has joined its organization as vice president. English will be in charge of sales and will also serve as assistant general manager. Pipe Protection operates coating and wrapping plants at Elizabethport, N. J., Lowell, Mass., and at customers' job sites.

English was formerly Eastern division manager for H. C. Price Company, Somastic division. He is a member of the National Association of Corrosion Engineers, in which he is an officer of the Northeast region.

When the chips are down and you are up against it

Call Santa Fe

When you get up against a tough shipping problem just call your Santa Fe freight man... let him work it out and make it easier for you.

F. H. Rockwell, Gen. Freight Traffic Manager
Santa Fe System Lines, Chicago, Ill.

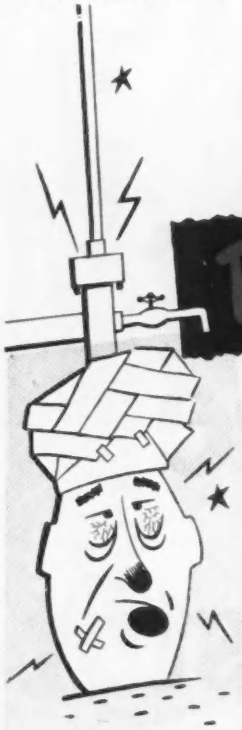
New Books, Maps and Movies

SPINDLETOP . . . WHERE OIL BECAME AN INDUSTRY, compiled under the supervision of Spencer W. Robinson. Spindletop 50th Anniversary Commission, P. O. Box 3150, Beaumont, Texas. $3 postpaid.

The energetic celebration of the 50th anniversary of the discovery of the Spindletop oil field is recorded in this book. The historical record of the discovery is included, although most of the volume is concerned with the anniversary observance. Full texts of addresses presented by noted industry and government leaders are given. The large number of photographs depict the color of the early days of the Spindletop field, as well as events during the celebration. There are also many photos of the men and women who participated in the work of the Spindletop 50th Anniversary Commission.

OIL AND PETROLEUM YEAR BOOK—1951, compiled by Walter E. Skinner. Walter E. Skinner, 20 Copthall Avenue, London E.C.2, England. $4 postpaid.

The 42nd edition of this reference work gives information on 762 companies operating in all parts of the world and covering all branches of the oil industry. Included is a list of names and addresses of 492 managers and engineers and the companies with which they are connected. Each company's listing comprises names of directors and other officials, description of business, where operating, crude production, refinery runs, details of capital, dividends and financial results. The Buyers' Guide of Manufacturers of oil field and refinery equipment contains 705 headings.

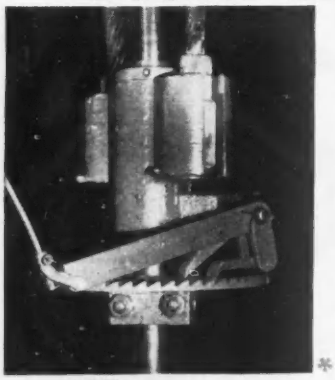


A SURE CURE for PARAFFINITIS*

There is no need to put up with this malady . . . no need to give your wells frequent and costly treatments of steaming out or pulling the rods to remove paraffin and maintain production.

Huber Paraffin Scrapers are a permanent cure for paraffin accumulation. Attached to the sucker rods, they wipe the tubing walls clean of paraffin. The scraper blades are shrink-fitted to the rods which are rotated by the Huber Rotating Rod Hanger. Wiping action takes place as the string is rotated and reciprocated.

DOUBLE BENEFIT ROTATION



The combined rotating and reciprocating motion wipes paraffin from the tubing in particles so small they go out in solution . . . can not clog tubing, scrapers, or flow lines. Rod rotation prolongs coupling life by equally distributing wear . . . prolongs pump life and efficiency by equalizing wear on working barrel. Get this added benefit while eliminating paraffin accumulation by installing Huber Scrapers and Huber Rotating Rod Hangers.

Cure your wells of paraffin accumulation . . . install Huber Paraffin Scrapers and Rotating Rod Hanger, NOW!

* Congestion caused by the accumulation of paraffin in pumping wells.

For further information see your local supply store, or write

HUBER

J. M. HUBER CORPORATION,
Box 831 . . . . . Borger, Texas

PARAFFIN SCRAPERS

SCRAPE AS THEY ROTATE AS THEY RECIPROCATE

CANADIAN SALES: Northwest Industries, Ltd., Municipal Airport, Edmonton, Alberta, Canada.

OIL AND GAS FIELDS OF THE TEXAS LOWER GULF COAST, by Dr. Frank L. Gardner. Petroleum News Corporation, P. O. Box 331, Houston. $50 ($25 to subscribers to *Five Star Oil Report*).

A study of the Texas counties in Railroad Commission District 2, data in this 240-page volume include general statistics, tabulation of petroleum industrial plants, and cumulative production information, as well as a breakdown by fields. The book covers 350 fields in Bee, Calhoun, DeWitt, Goliad, Jackson, Karnes, Lavaca, Live Oak, Refugio and Victoria counties. A map of each county is provided, as well as an outline discussion of fields within the county. For each field is listed production history, geographic and geologic description, operators, market outlets, and other pertinent data. This review of the Texas Lower Gulf Coast is the first in a series of 12 volumes designed to cover all Texas, New Mexico and Coastal Louisiana, the publishers state.

PETROLEUM CONSERVATION, edited by Stuart E. Buckley. Petroleum Branch, American Institute of Mining and Metallurgical Engineers, Dallas. 324 pages. $6 ($3 to AIME members).

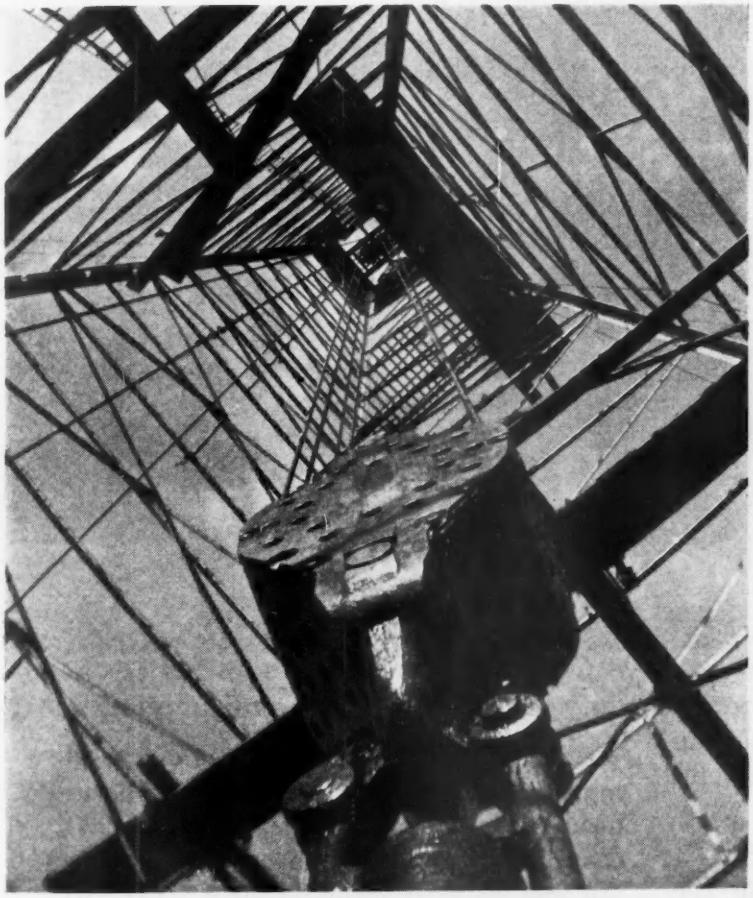
Technically accurate, but written in the language of laymen, this book presents basic principles of petroleum conservation so as to offer summary and review for experienced engineers, a textbook for engineering students, or an understandable reference book for persons without technical training. Written and edited by petroleum engineers, the book's engineering theses are well known and almost universally accepted by petroleum engineers and have been adequately proved by extensive oil field experience. However, these conservation principles have not yet been adopted to full benefit by the petroleum regulatory bodies of oil states. "Petroleum Conservation" may promote better understanding of the need for and means of effecting improved practices.

OIL AND GAS FEDERAL INCOME TAXATION, Second Edition—1951, by Kenneth G. Miller. Commerce Clearing House, Inc., 214 North Michigan Avenue, Chicago 1, Ill. $7.50.

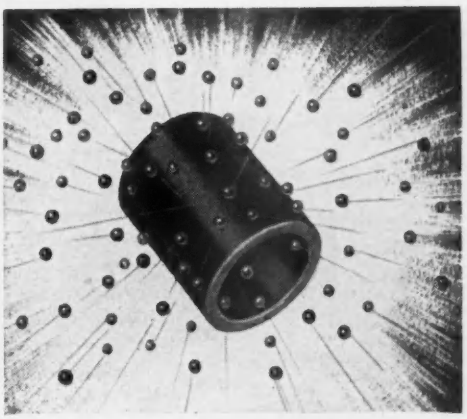
Changes in oil and gas taxation laws since 1948 are incorporated in this revised edition to bring together in one volume the current federal laws. The author states that the purpose of the book is "to correlate the law, regulations, rulings and decisions applicable to this specialized tax field." The data are classified by subject and indexed by topic and case.

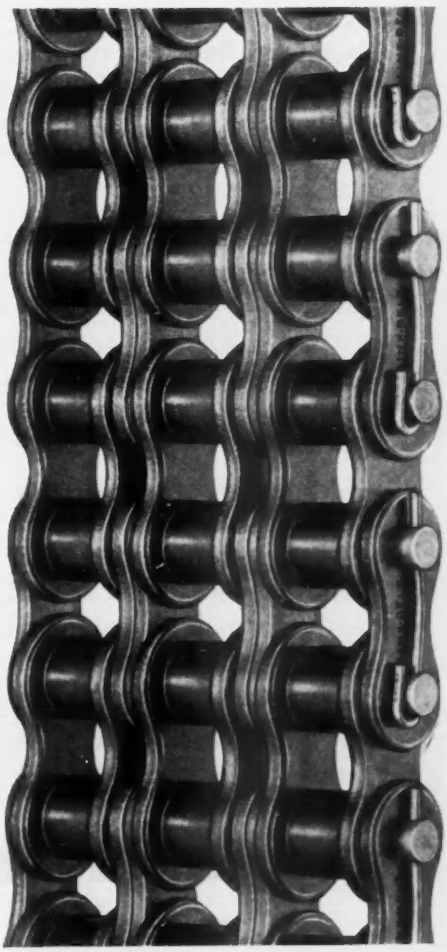
In the Oil Country...

DOWN-TIME HURTS!



Shot-peening hammers extra performance, extra life into Link-Belt Roller Chains





Up comes 15,000 feet of drill pipe at high speed. Sudden stops, sudden starts, rough handling of equipment to get the job done. It's *time* that counts most in the oil country. And, it's *down-time* that hurts. Drilling equipment, in these days of three-mile-deep holes, *must stand the gaff!*

Link-Belt, through 75 years of research, is taking care of your chain problems. Shot-peening of rollers in Link-Belt Precision Steel Roller Chains is *just one* of the ways we're doing it. Thousands of tiny steel balls hammer extra fatigue life into the rollers. You get a longer service life. This and other *extra* Link-Belt features so widely known in the oil fields of the world help repay your chain costs in down-time saved.

Get all the facts from your nearest Link-Belt office.

LINK-BELT

PRECISION STEEL ROLLER CHAIN

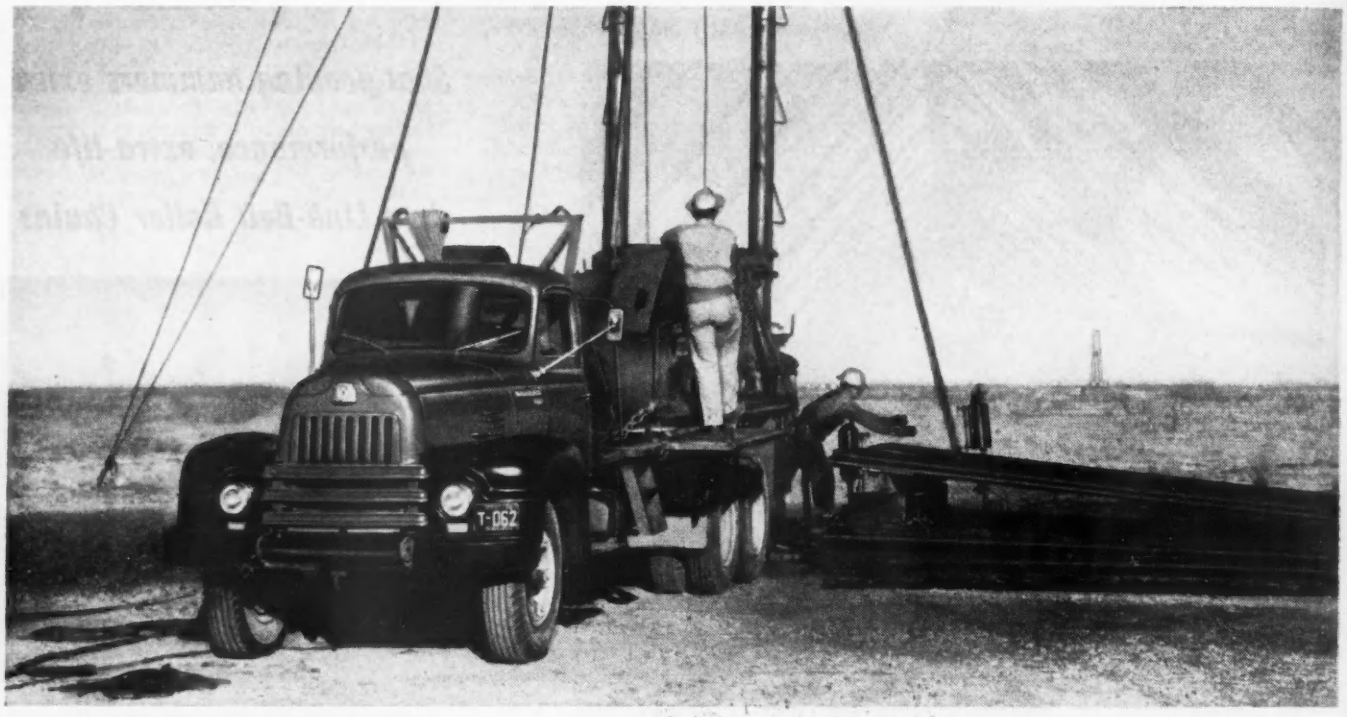
LINK-BELT COMPANY: Indianapolis 6, Dallas 1, Houston 1, Kansas City 8, Mo., Los Angeles 33, New York 7, Toronto 8. Distributors in all fields. 12,833

Easier coupling and uncoupling without sacrificing load distribution

Patented E-Z Assembly feature of Link-Belt Precision Steel Roller Chain permits easy coupling and uncoupling of multiple width chains—right on the job. Press-fits between chain pins and middle bars have been modified, but full load-carrying capacity across entire width of chain has been maintained.

A point we'd like to "drill" home:

There's an INTERNATIONAL TRUCK to do the job BETTER!



In the oil fields, or any place else where a truck is needed, invariably there's an International to handle the job more efficiently. This is easy to understand when you remember that:

1. Internationals are specialized for the job! Start with 115 basic models, add thousands of specialized variations. The answer is obvious: You get a truck perfectly adapted to the job, consequently, a truck that does it better. You choose from America's most complete line of trucks.

2. Internationals mean longer truck life! International Trucks have the ruggedness and stamina to stand up on the toughest jobs. You get longer truck life and the kind of performance that means lower operating and maintenance costs.

Here's proof of that statement: International Trucks have been *first* in heavy-duty truck sales for 19 straight years!

3. Internationals give you these outstanding truck features! Great new valve-in-head engines, roomy **COMFO-VISION CABS,** easy steering, and super-maneuverability are just some of these features. They add up to better work from drivers, bigger profits for owners.

Make a feature-by-feature comparison of an International with any other make of truck. You'll learn why an International is the smartest truck investment you can make.

Do it now. For that new truck, go first to your International Truck Dealer or Branch. You won't have to go any farther.

International Harvester Builds McCormick Farm Equipment and Farmall Tractors... Motor Trucks... Industrial Power... Refrigerators and Freezers

INTERNATIONAL HARVESTER COMPANY • CHICAGO

INTERNATIONAL TRUCKS

"Standard of the Highway"

POSITIVE PROTECTION AGAINST CORROSION

You can line up to 5 miles of pipe in place with RESOWELD

UNDERGROUND pipe lines up to 5 miles long can be coated *in place* with RESOWELD—Goodyear's lining material especially developed by the G.T.M. —Goodyear Technical Man—for oil field use. And look at the results you can expect!

Unlined metal piping handling sour West Texas crudes failed in 18 to 24 months.

RESOWELD *coated pipes in service 34 months to date — should be good for 5-7 years' minimum service.*

Results like this with highly corrosive crudes indicate that RESOWELD is your best buy for protection of your metal equipment. Ask the G.T.M. for details, or write Goodyear, Akron 16, Ohio.

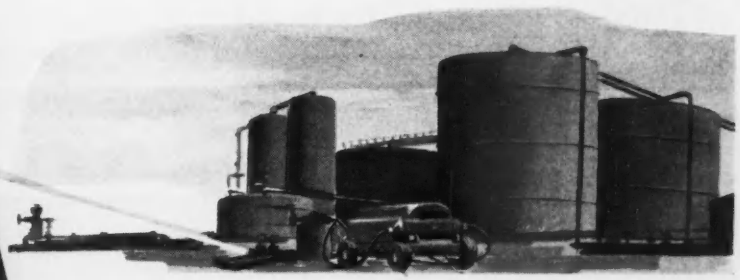
GOODYEAR INDUSTRIAL RUBBER PRODUCTS

GM-Specified

APPLICATIONS for RESOWELD

Pipe Lines—coated in place up to 5 miles in length
Tanks—oil storage
Christmas Trees
Steel Hulls of Tankers and Barges
Substructures and superstructures of offshore rigs—

AND WHEREVER CORROSION OF METAL SURFACES EXISTS



FOR HOSE, FLAT BELTS, V-BELTS, MOLDED GOODS, PACKING, TANK LINING, RUBBER-COVERED ROLLS *built to the world's highest standard of quality, phone your nearest Goodyear Industrial Rubber Products Distributor.*

GOODYEAR

THE GREATEST NAME IN RUBBER

We think you'll like "THE GREATEST STORY EVER TOLD"—Every Sunday—ABC Network

Resoweld—T.M. The Goodyear Tire & Rubber Company, Akron, Ohio

Great AMERICANS

Easily removable mule heads save you time on AMERICAN PUMPING UNITS

American gives you engineering features that provide economical, trouble-free operation. Write for CATALOG 151 describing American Units for *every* pumping requirement. Contact your favorite supply store or the nearest American office.

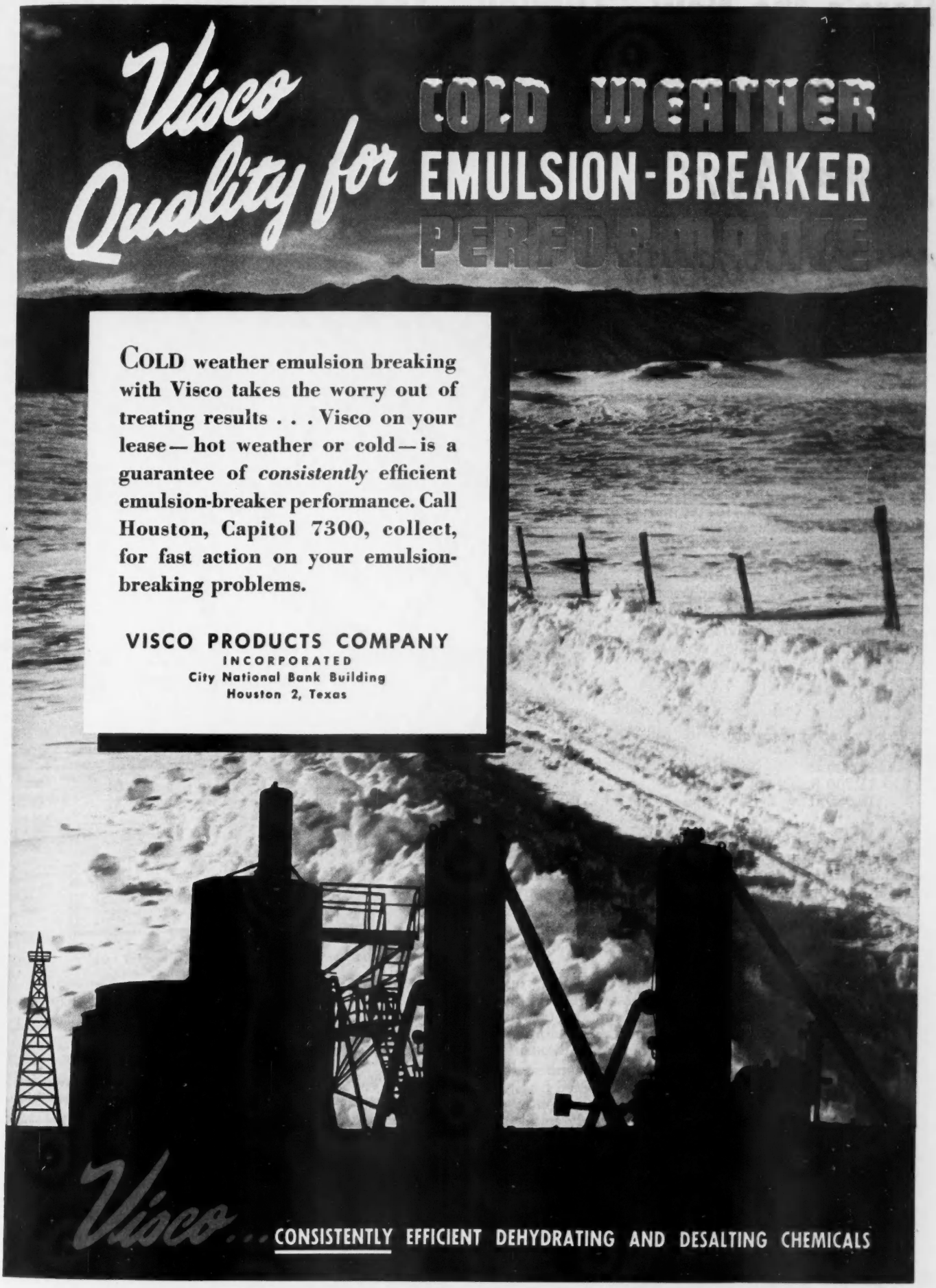
AMERICAN MANUFACTURING COMPANY OF TEXAS

AMCOT

Branch offices:
Houston, Texas, 320 West Bldg., Ph. Ch. 4-3301
Tulsa, Okla., 1506 Hunt Building, Phone 4-8785
Kilgore, Texas, P. O. Box 222, Phone 2338
Odessa, Texas, P. O. Box 983, Phone 3472
New York, N. Y., 500 Fifth Ave., Ph. LA. 4-4857

FORT WORTH 1, TEXAS PHONE VALLEY 2301

Visco Quality for COLD WEATHER EMULSION-BREAKER PERFORMANCE



COLD weather emulsion breaking with Visco takes the worry out of treating results . . . Visco on your lease — hot weather or cold — is a guarantee of *consistently* efficient emulsion-breaker performance. Call Houston, Capitol 7300, collect, for fast action on your emulsion-breaking problems.

VISCO PRODUCTS COMPANY
INCORPORATED
City National Bank Building
Houston 2, Texas

Visco... CONSISTENTLY EFFICIENT DEHYDRATING AND DESALTING CHEMICALS

NOTICE: Visco Products Company is authorized to manufacture and sell Visco Oil Treating Compounds for use in the breaking and resolving of oil emulsions, or to grant licenses for such use, under the following United States Letters Patent: 2,050,639; 2,050,640; 2,206,589; 2,214,783; 2,214,784; 2,225,189; 2,303,414; 2,307,813; 2,318,034; 2,318,035; 2,321,056; 2,335,554; 2,454,808; 2,514,399. Visco Products Company is willing to grant licenses on a royalty basis, to oil companies, and to others desiring to practice the patented subject matter, under any and all of the above Letters Patent, permitting the user to purchase the oil treating compounds at will from any vendor, or to prepare the compounds for use or to use the compounds under the above Letters Patent. Application for license should be made to: **Visco Products Company,** Houston, Texas.

Here's the New "Oilwell" 133-B Portable Derrick

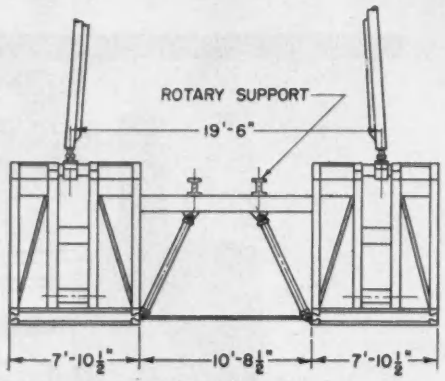
Taller, More Rigid, Greater Capacity

THIS new 133-foot portable derrick has many new and improved features over the field-proven 128-B series, such as: (1) increased height, (2) greater load capacity, (3) lower line pull in raising, (4) increased width of substructure, (5) adjustments on all four legs, (6) easier and faster means of assembly as well as (7) a variety of accessories which make it readily adaptable to various makes of draw works and drives.

The derrick is of welded tubular construction which, pound for pound, gives greater compression strength and rigidity than any other type of construction.

Pipe racking capacity with full-hole tool joints is—

12,200 ft.	3½" pipe
11,700 ft.	4½" pipe
10,980 ft.	5" pipe



LARGER FLOOR SPACE—floor space between legs, 19' 6" x 14' 0½". Window opening front side, 98' 7".

Reduced raising load—An improved stringing method for the raising lines utilizes the increased block travel to reduce line pull in raising this taller derrick.

Fast, easy assembly—The derrick is completely assembled at ground level and does not require lifting to the floor level. In fact, only one light gin-pole truck is needed in assembling the sections.

Greater safety in raising—During the raising operation, the center of gravity never passes over the pivot point as the pivot point is shifted from front to rear legs at approximately 23° from vertical. This eliminates the need to snub the derrick into the final position.

Other advantages—(1) Sealed tubular seamless steel construction, (2) easy-to-handle sections joined by tight-fitting, dowel-pin flanges, (3) six-sheave, center-pin crown block which distributes weight evenly to all four legs, (4) adjustment facilities for aligning center line of block with center line of well, (5) adjustable pipe rack with positive locking safety fingers, (6) gin poles which form draw works and engine-drive cover frame, (7) fast line from draw works running inside the derrick with traveling block in view at all times and (8) deadline held down by special anchor.

Ask . . . your nearest "Oilwell" Representative for complete information on the 133-B Portable Derrick.

OIL WELL SUPPLY COMPANY

Branches Serving All Oil Fields

Executive Office—DALLAS, TEXAS
Export Division Office—
30 ROCKEFELLER PLAZA
NEW YORK 20, N. Y.

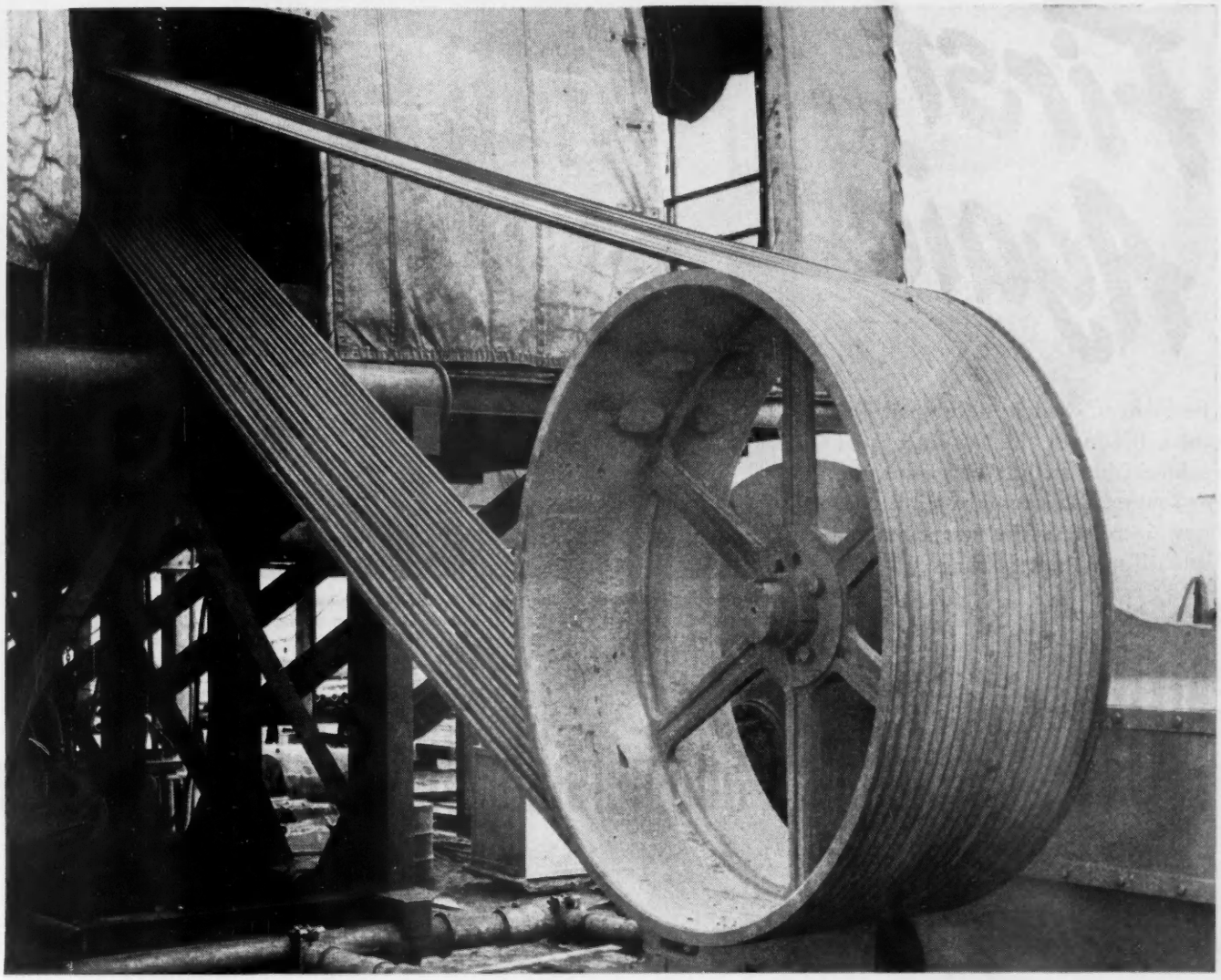
Division Offices—CASPER, WYOMING
COLUMBUS, OHIO . . . DALLAS, TEXAS
HOUSTON, TEXAS...TULSA, OKLAHOMA
LOS ANGELES, CALIFORNIA

USS TRADE MARK

"OILWELL" TRADE MARK

UNITED STATES STEEL

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



Here B. F. Goodrich grommet belts are saving $104.50 a month

B. F. Goodrich grommet V belts cut costs 20 to 50%

THESE 18 V belts are needed to drive heavy pumps for drilling oil wells. The belts have to operate 24 hours a day, 7 days a week, in all sorts of weather. Ordinary belts couldn't stand the heavy pulling load, couldn't take the strain of round-the-clock operation. They averaged 9 months' life in this kind of service.

Then B. F. Goodrich grommet belts were tried. After 19 months, and drilling wells totaling 76,000 feet deep, these grommet belts look as good today as the day they were installed. Here's why B. F. Goodrich grommet belts can be counted on to save on belt costs:

No cord ends — A grommet is endless, made by winding heavy cord on itself to form an endless loop. It has no overlapping ends. Because most of the failures in ordinary V belts occur in the region where cords overlap, the endless cord section in a grommet V belt eliminates such failures.

Concentrated cord strength — All of the cord material in a B. F. Goodrich grommet multiple-V belt is *concentrated* in twin grommets, positioned close to the driving faces of the pulley. No layers of cords to rub against one another and generate heat; cord and adhesion failures are reduced.

Better grip, less slip — Because a grommet is endless, a grommet V belt is more flexible, grips the pulleys better. Size for size, grommet multiple-V belts will give ⅓ more gripping power, pull heavier loads with a higher safety factor.

Only B. F. Goodrich has the grommet!—No other multiple-V belt is a grommet V belt (U. S. Patent No. 2,233,294). Now available in C, D and E sections. See your local B. F. Goodrich distributor. *The B. F. Goodrich Company, Industrial & General Products Division, Akron, Ohio.*

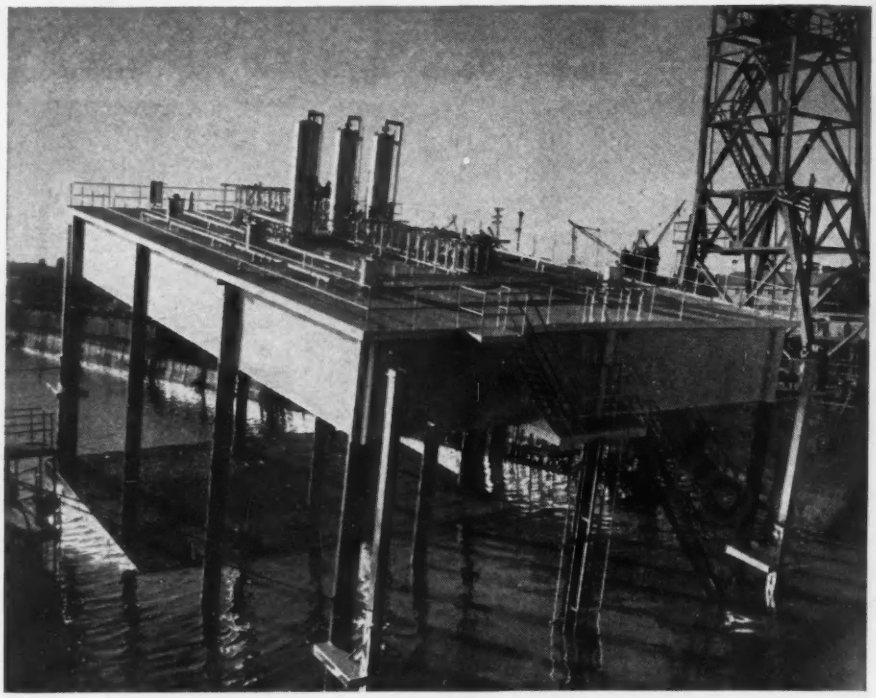
Grommet V Belts BY

B.F.Goodrich

RUBBER FOR INDUSTRY

First Again

Bethlehem, which developed for the oil industry the *first* integrated submersible drilling barge and the *first* submersible compressor barge, now introduces the *first* submersible oil tank battery barge.



Constructed by Bethlehem's Beaumont Yard, this submersible tank battery barge can store 4,800 bbls of crude in its 72 ft x 48 ft x 8 ft superstructure. Part of the 80 ft x 52 ft x 5 ft float is submerged in this view.

NOW...Bethlehem's Submersible Oil Tank Battery Barge

For the Most Economical and Efficient Interim Storage of Crude in Shallow Water or Marshland

- Storage Capacity to Suit Your Requirements.
- Complete with Pumps, Oil and Gas Separators and Compressors.
- Eliminates Need for Costly Erection Crews Miles from their Base.
- No Piling to Pull or Cut when Moved.
- Mobility, if and when Necessary . . . with 100 per cent Salvage.
- Leakproof . . . Solves Pollution Problem.

Our engineers will be happy to supply further details on request.

SHIP REPAIR YARDS

Boston Harbor	New York Harbor
Baltimore Harbor	Beaumont, Texas
Los Angeles Harbor	San Francisco Harbor

SHIPBUILDING YARDS

Quincy, Mass.	Staten Island, N. Y.
Sparrows Point, Md.	Beaumont, Texas
Terminal Island, Calif.	San Francisco, Calif.

SHIPBUILDERS *SHIP REPAIRERS*

BETHLEHEM STEEL COMPANY

Shipbuilding Division

General Offices: 25 Broadway, New York 4, N. Y.

On the Pacific Coast shipbuilding and ship repairing are performed by the Shipbuilding Division of Bethlehem Pacific Coast Steel Corporation

Pipeline on the March

... And a fast-stepping "march" it is with "Caterpillar" equipment in command. Just the kind of equipment that's needed to speed projects directly or indirectly associated with the national defense! To supply both rearmament and civilian activities with natural gas, the final section of the big "Super Inch" is here seen approaching its terminus near Llanada, California. With military unison, three "Cat" D8 Tractors put long stretches of welded pipe to bed – fast but gently. Of course they're outfitted with the right gear for such work. Offset track, plus added counterweighting, puts mighty lifting-and-lowering capacity into their Trackson Pipe Layers.

Because the work is tough, varied – and ceaseless around the clock – "Caterpillar" equipment has figured in the construction of most of the estimated 17,000 miles of pipeline laid in '51. It is widely preferred because (1) "Cat" machines can handle so many pipeline jobs – in clearing right of way, ditching, stabbing, welding, wrapping, doping, lowering, backfilling, cleaning up; (2) because they STAND UP under all kinds of punishment; and (3) because there is always within reach a "Caterpillar" dealer rich in experience and facilities for keeping them on the job. So, while governmental emergency demands come first –

Take your maintenance problems to your "Caterpillar" dealer* BEFORE *parts are worn beyond repair

He can build up track grousers, rerim sprockets, turn track pins and rollers for new wearing surfaces, refinish cylinder liners and crankshafts, recondition pistons, cylinder heads, radiators – salvage many other parts that will keep your machines operating dependably and lengthen their life.

CATERPILLAR, PEORIA, ILLINOIS

You're the Doctor

Good care is good medicine—for man or machine

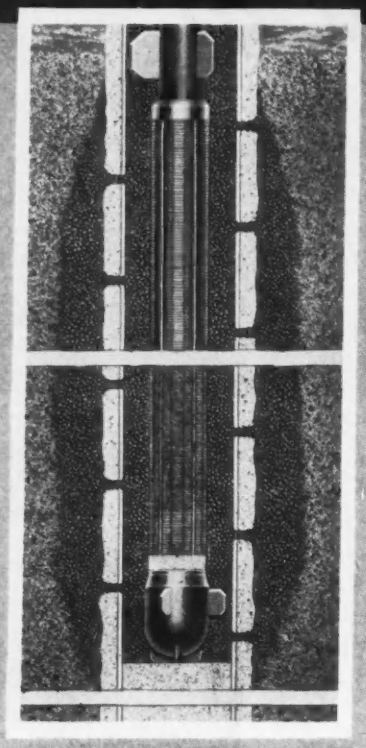
CAREFUL LUBRICATION practices, for instance, will add much to your satisfaction through equipment performance, economy and long life. Use only recommended lubricants, changing the lubricant at proper intervals . . . and use *only* "Caterpillar"-proved filter elements. Remove dirt from fittings and clean around crankcase filler cap before adding oil. A little care saves many hours of engine life. *Consult the Lubrication Chart in your Operator's Instruction Book.* AND REREAD THE BOOK OFTEN.

CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT

THE LAYNE GRAVEL PACK...



Eliminates **SAND TROUBLE** • • •

Lengthens **WELL LIFE** • • •

More and more operators are having Layne & Bowler Gravel Pack their wells . . . thus eliminating sand trouble and lengthening the life of the well.

If you are confronted with the expense of frequently pulling tubing to replace sanded up screen and sand cut parts and other expense involved in reworking wells, consult Layne & Bowler engineers on the Layne Gravel Pack . . . the modern way of controlling productive sands.

for complete information

write

THE LAYNE AND BOWLER COMPANY

General Office & Factory

8000 MARKET STREET HOUSTON, TEXAS

ROCKWELL ORIFICE METERS

Take high pressures in stride

WITH NEW LEAKPROOF STUFFING BOX

When the pressure is *up*, it will pay you to use Rockwell orifice meters. They have the exclusive advantage of a revolutionary new stuffing box that prevents leakage troubles at this vulnerable point. The unit is self-lubricated, requires no maintenance. The higher the pressure, the tighter it seals—yet the shaft will freely rotate even under extreme conditions.

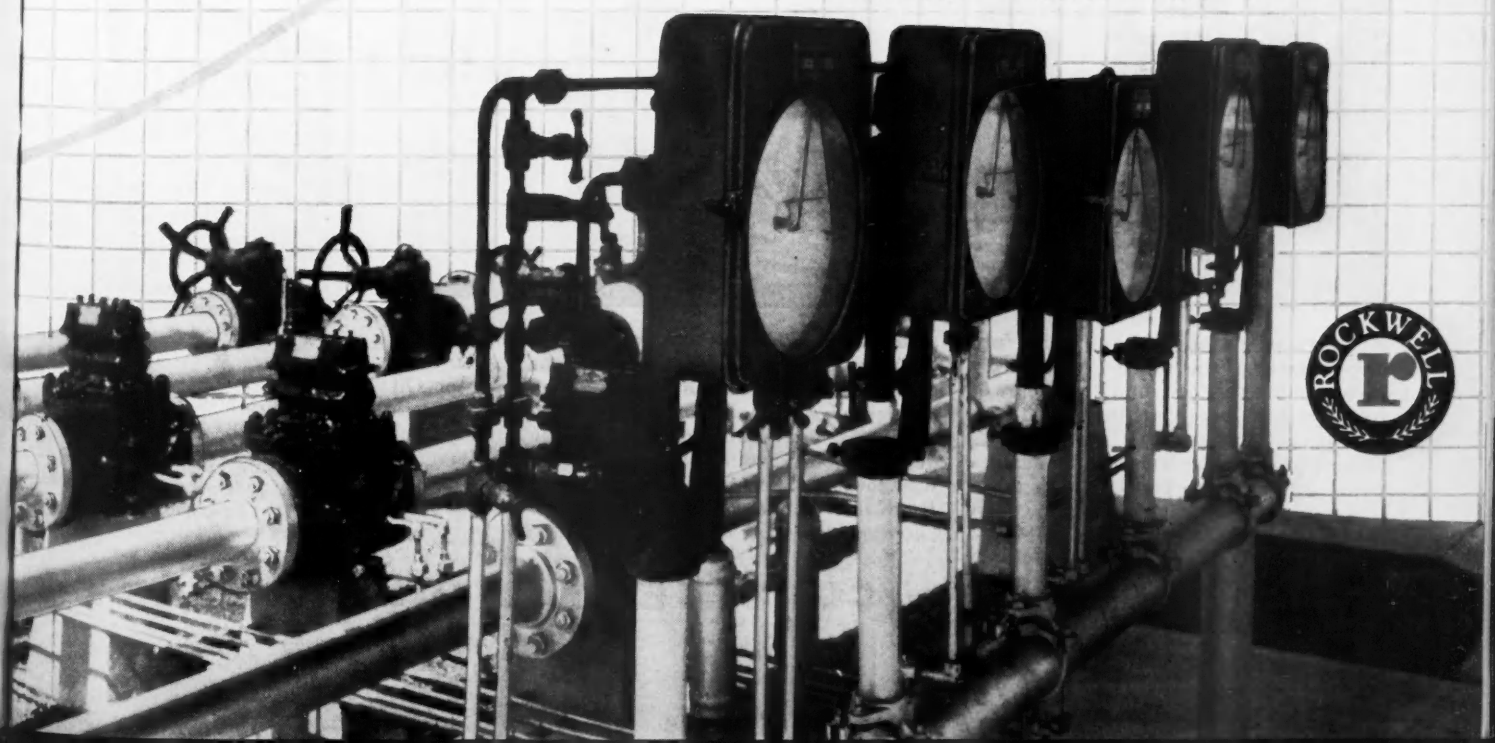
You'll get this new leakproof stuffing box *plus* forged steel chambers, unit manometer construction, positive inking pens and a host of other features in Rockwell orifice meters. For either high, low or intermediate pressures they are your best buy. Write for bulletin 1050.

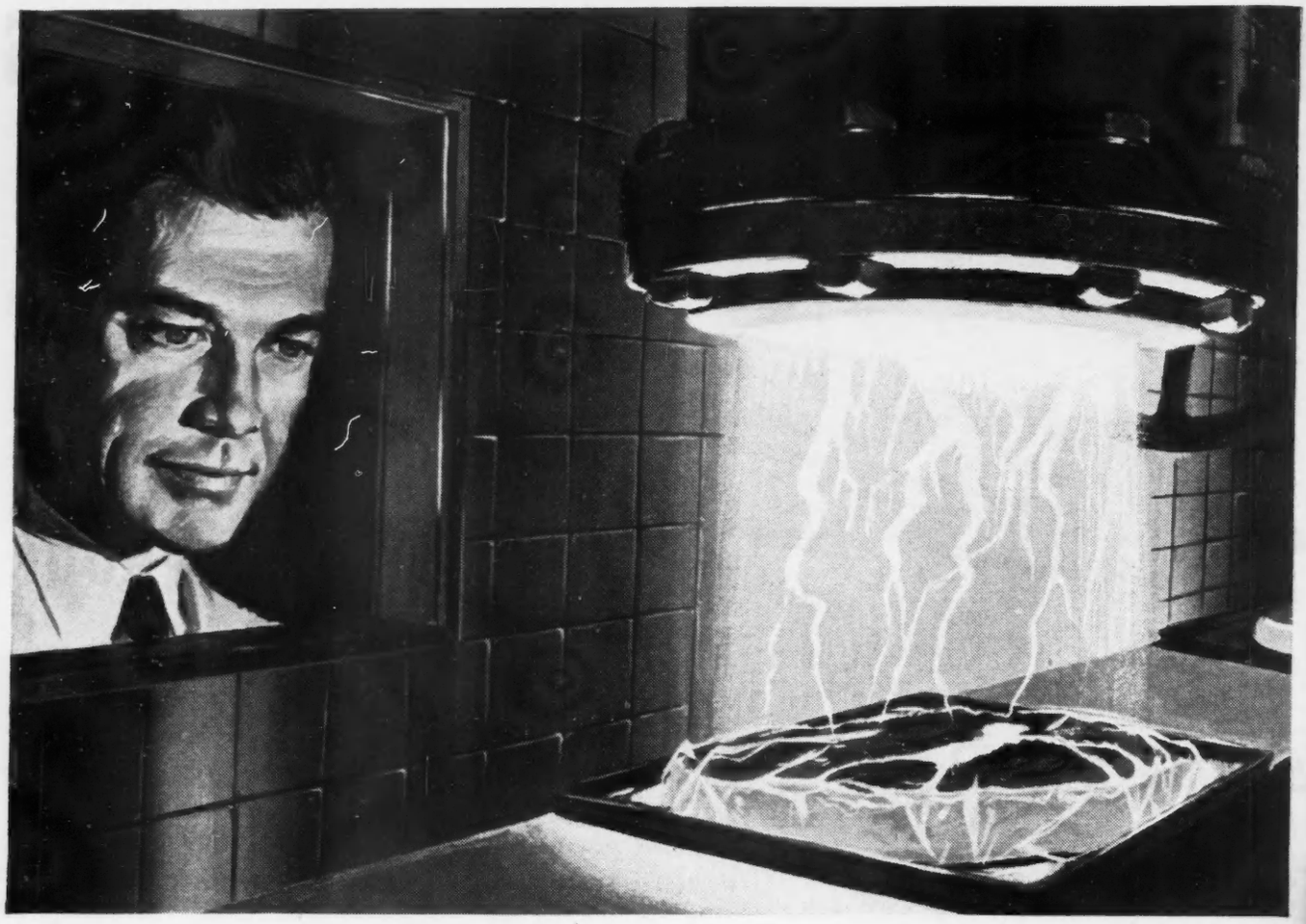
Stuffing Box Details

This unit has a *combination packing and bearing* made of Teflon. The material is tough, chemically resistant, stands up to 400° F. and has a low coefficient of friction. Teflon flows slightly under pressure to adjust itself to the stuffing box body and the periphery of the shaft. It seals without binding! The spring loaded follower serves as a pilot to hold the Teflon in alignment. All other parts are stainless steel. Packaged stuffing box kits for converting meters in service are available.

ROCKWELL MANUFACTURING COMPANY
Pittsburgh 8, Pa.

Atlanta • Boston • Chicago • Columbus • Houston
Kansas City • Los Angeles • New York • Pittsburgh
San Francisco • Seattle • Tulsa





"Lightning" strikes your steak!

1. **After years without refrigeration,** your next steak can taste as fresh as the day you bought it . . . thanks to having been struck by "lightning". Recent experiments show that three million volts of electricity release electrons that crash through perishables, killing every organism that causes decay, without affecting the food itself. Years later, you can take it from the pantry shelf, cook it, and eat it!

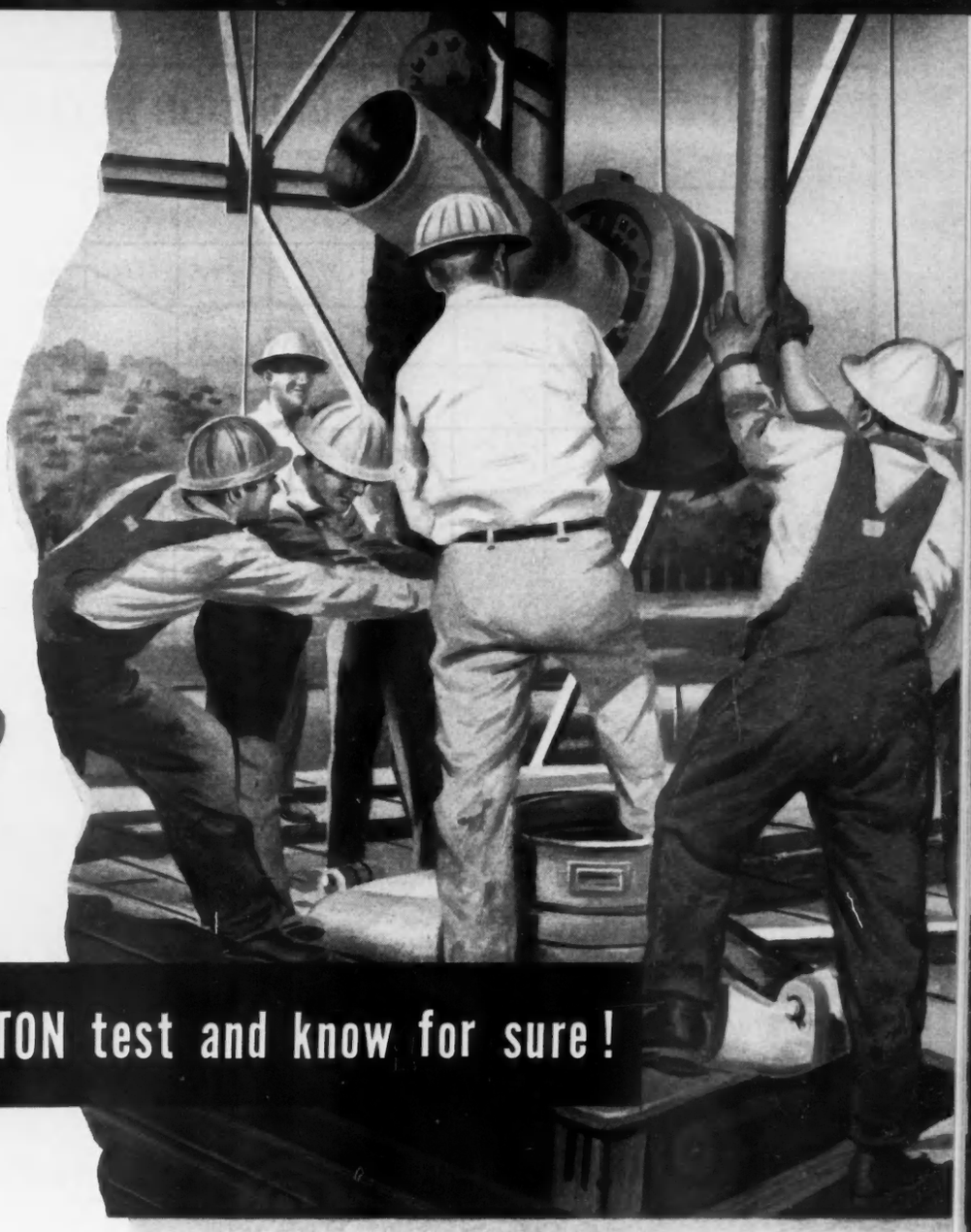
2. **Years of research** have gone into development of this process, which may revolutionize the food industry. Years of research, too, have gone into the development of Conoco Super Motor Oil, to protect your automobile engine against wear. Conoco Super checks the accumulation of harmful water and acids, chief causes of winter wear.

3. **50,000 Miles—No Wear!** After a punishing 50,000-mile test, *with proper drains and regular care,* engines lubricated with Conoco Super Motor Oil showed *no wear of any consequence:* an average of less than one one-thousandth inch on cylinders and crankshafts. Gasoline mileage for the last 5,000 miles was actually 99.77% as good as for the first 5,000. Proof that Conoco Super, with its OIL-PLATING, *can* keep your new car *new!*

Now in its 76th year, Continental Oil Company is still a leader in oil research and a pioneer in oil-perfecting additives, with more than 100 patents on discoveries that lengthen the life of your car.

© 1951 **CONTINENTAL OIL COMPANY**

Oil? Gas? Water?



We made a JOHNSTON test and know for sure!

AFTER GETTING CASING from anywhere and everywhere you can't *afford* to run it in a hole that might turn out dry. The *scarcity* and *cost* of casing has meant an even more important place for the Johnston Open Hole Tester in deciding whether or not to set casing. The unfailing dependability of this Tester has been proved in hundreds of holes over many years.

When it is *time to test*—and you want to know productive possibilities for *sure*—call Johnston. Service men are available twenty-four hours a day in all active areas.

JOHNSTON OIL FIELD SERVICE CORP.

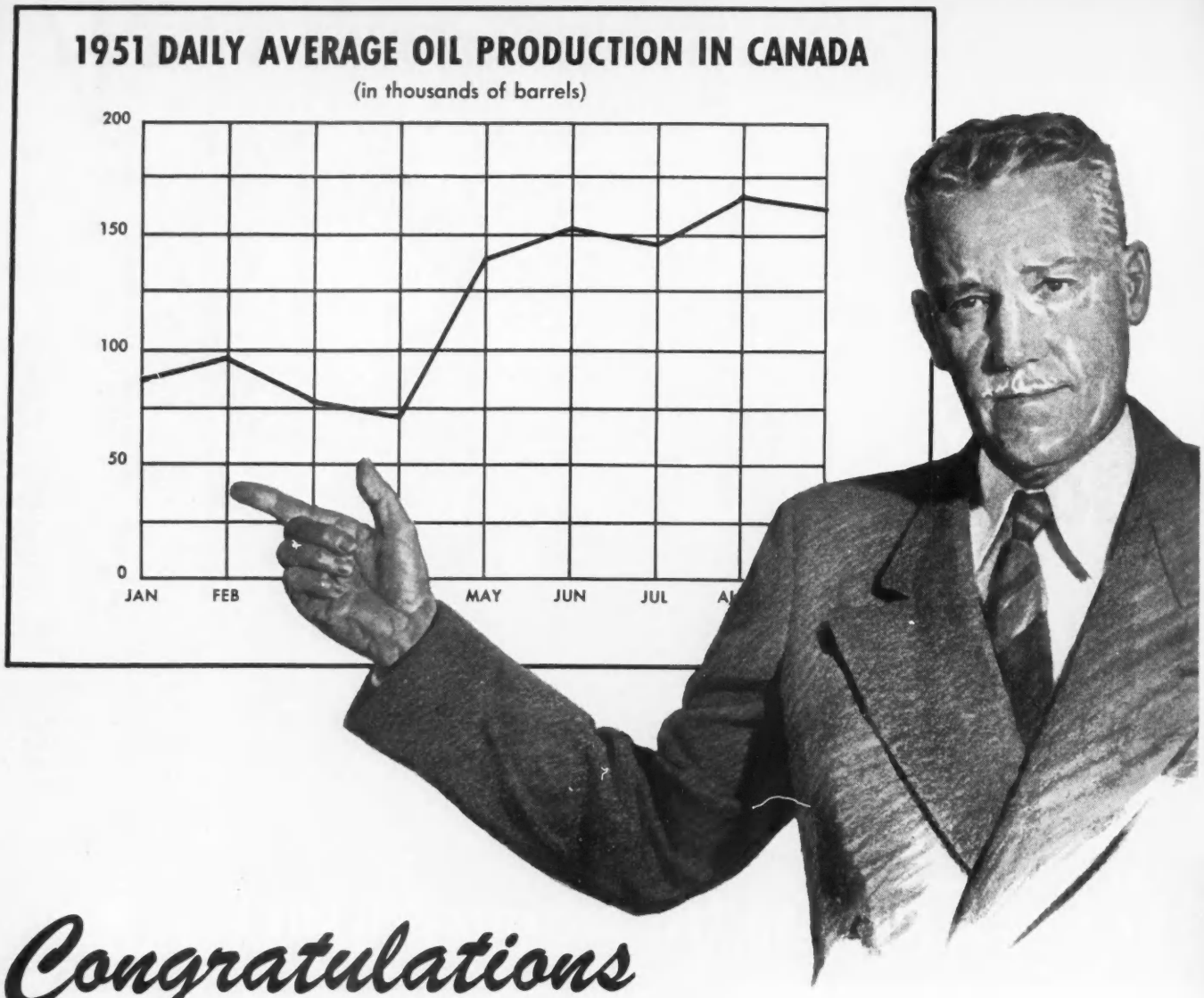
5702 NAVIGATION BOULEVARD HOUSTON, TEXAS

TEXAS—Houston, Beaumont, Alice, McAllen, Abilene, Cisco, Winters, Bowie, Gainesville, Graham, Jacksboro, Knox City, Throckmorton, Wichita Falls, Tyler, Victoria, Brownfield, Kermit, Midland, Odessa, San Angelo, Big Lake, Hebbronville, Snyder. ARKANSAS—Magnolia. ILLINOIS—Mt. Vernon. INDIANA—New Harmony. KANSAS—Great Bend, Liberal, Plainville, Pratt. KENTUCKY—Henderson. LOUISIANA—Houma, Lake Charles, Shreveport. MISSISSIPPI—Brookhaven. NEW MEXICO—Farmington, Hobbs. OKLAHOMA—Elk City, Healdton, Perry, Seminole, Pauls Valley.

M. O. JOHNSTON OIL FIELD SERVICE CORP.

Servicing California, Rocky Mountains & Canada

FORMATION AND JOHNSTON CASING TESTING



Congratulations

to the Canadian Oil Industry

As a rapidly developing producer of oil, Canada, right now, occupies the spotlight on the world stage. In 1949 her daily average production was 57,561 barrels. In 1950 it was 79,189. In June, July, August and September of this year, a daily average of over 157,000 barrels was achieved, with the figure topping 170,000 barrels in several weeks. Next to the United States itself, Canada is today the most active single oil area in the world. The extent of the area and the prospective reserves involved make this development of major significance in the world's economic and political future.

The Second National Bank of Houston offers oil and gas men who have extended their operations to Canada . . . banking service tailored to their needs. Situated at the hub of world oil activity and at the nation's second port . . . our combination of an expertly staffed Oil and Gas Division and a Foreign Department with correspondent bank relationships throughout the world, enables us to offer such operators complete financial and banking service. Confer with us.

44 Years of Service to the Southwest

The **SECOND NATIONAL BANK OF HOUSTON**

MAIN AT RUSK

CAPITAL AND SURPLUS TEN MILLION DOLLARS . . . MEMBER F.D.I.C.

82 STORES

AND WHAT THEY MEAN TO YOU

AMERICA NEEDS SCRAP TO MAKE MORE STEEL
YOU CAN HELP!

Our 82 stores in the United States and Canada, plus 17 sales offices and 6 resident salesmen, form a market desirable to major manufacturers and give us a close check on the performance of supplies and equipment internationally.

For these reasons anything you buy at your nearby Jones & Laughlin Supply store is choice—the best the market affords.

And your Jones & Laughlin Supply store is not a "Five & Ten". It is a major supply house for a mighty industry. One stop fills any order. May we fill your next one?

"... here's MY warehouse!"

Jones & Laughlin Supply Company

EXPORT: 405 Lexington Ave., New York, N. Y., U. S. A.

82 STORES • 17 OFFICES • 6 RESIDENT SALESMEN

***General Offices:* TULSA, OKLAHOMA**

J&L STEEL

Subsidiary of Jones & Laughlin Steel Corporation

"WHAT A TRAVELING BLOCK!"

"Mon, O' Mon, Did You Say 300 TONS?"

Something New Has Been Added!

NEW

300 Tons rated capacity

NEW

Double row, pre-adjusted, Timken bearings, mounted on 8" diameter shaft.

NEW

Johns-Manville "klipper" grease seals, self adjusting, positively retain lubricant.

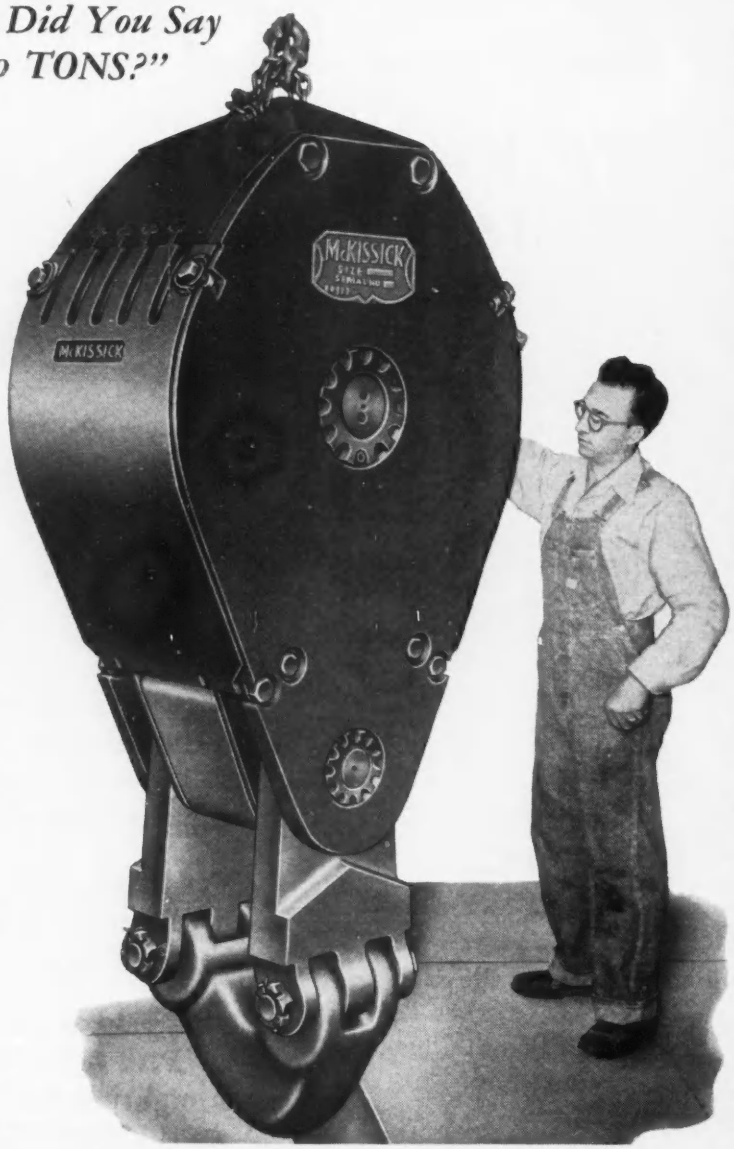
NEW

E-Z opening guards for quick stringing up.

NEW

42" diameter alloy steel flame hardened sheaves, 9000 streamlined pounds for fast falls and quicker round trips.

Write for catalog of this and other McKissick Products.

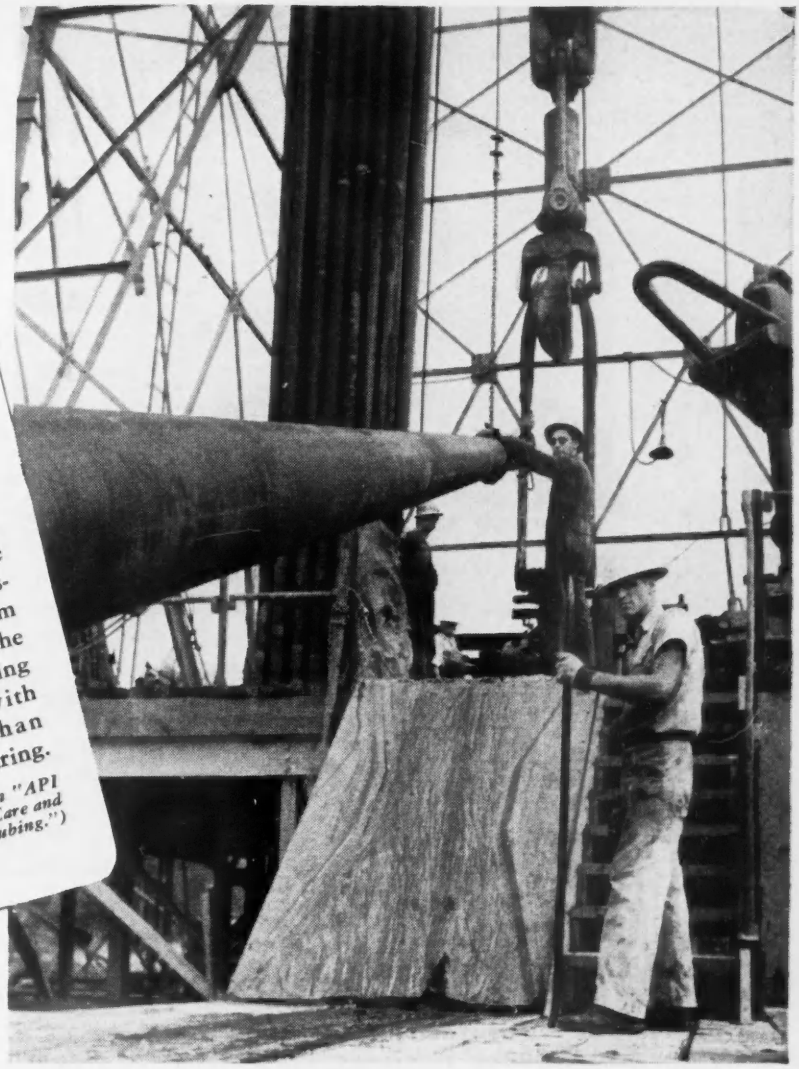


McKISSICK BUILDS A BETTER BLOCK FOR EVERY PURPOSE

McKISSICK PRODUCTS CORPORATION
Box 2496 Tulsa, Oklahoma

McKISSICK

How to keep joints in their place



Reminders of Good Casing Practice

For mixed or unmarked strings, a drift or "jackrabbit" should be run through each length of casing when it is picked up from the catwalk and pulled onto the derrick floor, to avoid running a heavier length or one with lesser inside diameter than called for in the casing string.

(Reprinted by permission from "API Recommended Practice RP5C1: Care and Use of Casing, Drill Pipe and Tubing.")

MAKE EVERY JOINT A STRONG POINT

with Republic Electric Weld Casing

This modern casing tongs up to high joint strength . . . guards against costly pull-outs. Made by the improved Republic Electric Resistance Welding Process, it is uniformly round and uniform in wall thickness.

Joints have added pull-out strength because plenty of tough steel is left beneath thread roots at every point. Full-formed threads, solidly anchored in a uniform depth of tough steel, take hold with a bulldog grip.

Republic Casing offers extra resistance to severe external pressures, too. It is cold formed from high ductility steel . . . fully normalized for uniform wall structure . . . cold sized to further increase its high yield strength.

Every joint *is* a strong point when strings are run with Republic Electric Weld Casing and Tubing —field-proved by the many millions of feet which have been placed in service.

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N.Y.

REPUBLIC *Electric Weld* **NORMALIZED CASING AND TUBING**

REPUBLIC STEEL

Other Republic Products include Line Pipe—Carbon, Alloy and Stainless Steels—Upson Studs, Bolts and Nuts—Electrunite Heat Exchanger Tubes

"What have I got to lose if they break you up?"

Aside from any question of fairness, *people wonder how they'll be affected personally if the Anti-trust lawyers succeed in cutting big companies into smaller ones. We hear such comments as, "What have I got to lose if they break you up?"*

The answer depends on who you are. Most people gain in many ways by the fact that there are both large and small companies competing for your patronage, trying to get ahead. Here's what you stand to lose:

New products and improvements in old ones flow steadily from our laboratories—new gasolines and oils, raw materials for new fabrics, "soapless soaps"; other modern miracles. You may take such progress for granted. But Standard has put some 40 million dollars into research since 1940. We can't go on this way if they break us up.

Motorists get the finest service at Western gas stations; Standard led the way. Our technical counsel helps many industries cut production costs of goods you buy. We've pioneered in taking needed petroleum products into undeveloped farm and frontier areas. We can't give these services if we're forced to be small.

You are assured of ample supplies of petroleum products at reasonable prices. Standard is constantly seeking out new crude oil reserves in this country and abroad. This sometimes costs millions before the first gallon is found. We can do jobs this big, which benefit you as well as the country, only by being integrated.

America's military strength depends heavily on industry. Our fighting men are backed by *the world's greatest* production capacity. Should it now be *limited* by breaking up big companies? We are at work for our Government on atomic research, synthetic rubber, aviation gasolines, other jobs. We believe we perform them *best* by being *big.*

You have a lot to lose if they break us up. As a big, integrated company, Standard is able to operate more efficiently in serving you and helping to make America strong.

STANDARD OIL COMPANY OF CALIFORNIA

• plans ahead to serve you better

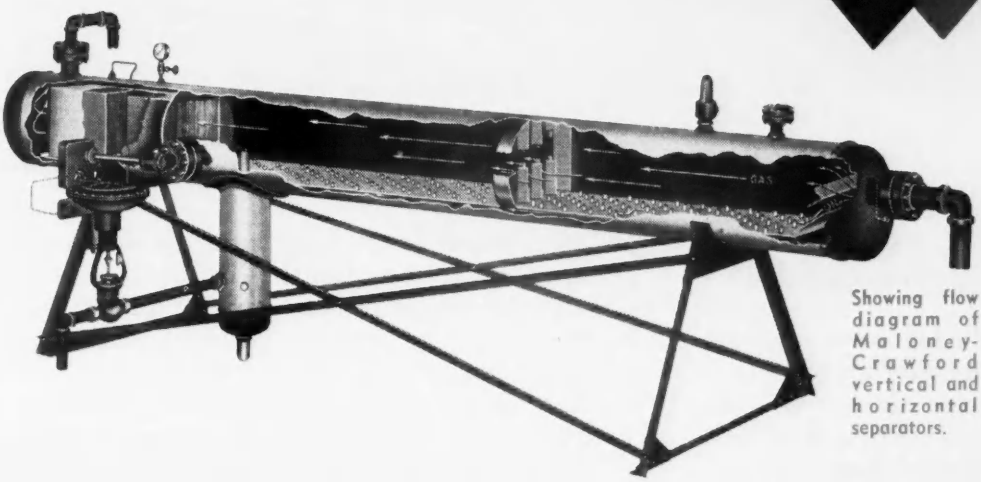
The Heart of an Oil and Gas Separator is the Flow System

MALONEY-CRAWFORD SEPARATORS HAVE FLOW SYSTEM FEATURES THAT GIVE

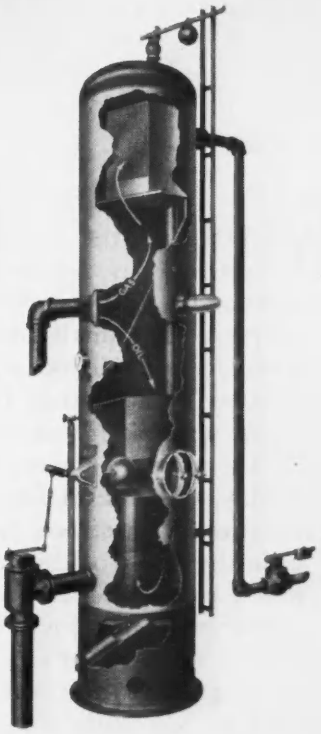
Maximum Separation

FLOW SYSTEM FEATURES

1. Absolute removal of condensed mist particles from gas stream into a "dead" space.
2. Equalization of pressures insures equal distribution of gas flow.
3. Positive sealing of element vane sheet bundle in element box prohibits by-passing of gas and insures thorough gas scrubbing.
4. Long travel of oil and gases at reduced velocities.
5. The patented "Vane Type" Maloney-Crawford Mist Extractor.



Showing flow diagram of Maloney-Crawford vertical and horizontal separators.



MALONEY-CRAWFORD RANGE OF MODELS AND PRESSURES OFFER A VERSATILITY TO MEET ALMOST ANY SEPARATION PROBLEM

STOCKS AND SERVICE AT THESE OIL CENTERS: Artesia, N. Mex.; Calgary, Canada; Corpus Christi, Texas; Dallas, Texas; Edmonton, Canada; Farmington, N. Mex.; Fort Worth, Texas; Houston, Texas; Lafayette, La.; New Orleans, La.; Odessa, Texas; Oklahoma City, Okla.; Tampa, Texas; San Angelo, Texas; Snyder, Texas; Tulsa, Okla.; Wichita Falls, Texas.

MALONEY CRAWFORD

MALONEY-CRAWFORD TANK & MFG. CO.

PETROLEUM EQUIPMENT SUPPLIERS MEMBER ASSOCIATION

FACTORY AND GENERAL OFFICE: 38 NORTH PEORIA—BOX 659—TULSA, OKLAHOMA
EXPORT REPRESENTATIVE: Baird Lines, 420 Lexington Avenue, New York, N. Y.
CANADIAN REPRESENTATIVE: Maloney-Crawford of Canada, Ltd., Edmonton, Canada
TEXAS PANHANDLE REPRESENTATIVE: H. W. Waddell, Pampa, Texas

AN IDEA in the minds of a small group of courageous men—that was Gulf half a century ago.

Starting as a small producing company with total assets of $750,000 in the late Fall of 1901, it was soon evident that future success was dependent upon Gulf's ability to operate as an integrated company—and to keep building.

Today, Gulf is an integrated world-wide organization with strong holdings in those countries in the free world where the largest crude oil reserves are located. Its growth has been constant, and currently it enjoys the distinction of being eighth in a select list of twelve American manufacturing companies, each with assets of more than a billion dollars.

But, hard-won gains and past achievements are not enough . . . Still needed are more courage, vision and capital, because we're looking forward to the second half-century.

A 200-million dollar expansion of the company's operations in 1951 is well under way. An aggressive program for the discovery and development of crude oil reserves continues. Refineries are being modernized and expanded. Supertankers are being added to Gulf's existing fleet, and other units of the transportation system are being expanded. Additions are being made to the research laboratories. New service stations will be built, existing ones modernized, and other outlets acquired.

All of this is eloquent and concrete testimony that we are planning for the second half-century.

Only by continuous planning and expanding, research, hard work and strict adherence to the principles formulated and followed in the first half-century can we be sure of giving the quality of service and product we desire to give in the next 50 years.

Gulf Oil Corporation · Gulf Refining Company
Gulf Building, Pittsburgh 30, Pennsylvania

FIFTY YEARS OF SERVICE
1901 GULF 1951
PETROLEUM AND ITS PRODUCTS

Thermoid
Industrial Rubber Products
Quality · Value · Service

Multi-V Belts For Tough Oil Field Service

Here's a cost-cutting combination! Thermoid Multi-V Belts . . . Rotary Hose . . . Mud-Flow Suction Hose . . . Flexible Discharge Units.

The going is tough for any equipment in oil field service. But not too tough for Thermoid Multi-V Belts!

Thermoid Multi-V Belts are pre-stretched to insure maximum power transmission without adjustment. They are constructed for flexibility and for ability to absorb repeated shocks—thoroughly impregnated with special rubber compounds to withstand moisture and abrasion. The result is longer belt life.

Thermoid Multi-V Belts are available in matched sets... uniform in size and cross section. Their longer life and non-slip performance add up to the lowest possible cost in any service.

Thermoid Multi-V Belts reflect the same care in manufacturing... the same constant research aimed at product improvement ... that have made Thermoid Products the standard of performance in the oil fields.

Mid-continent Office and Warehouse: Houston, Texas

SEE OUR CATALOG IN THE COMPOSITE CATALOG

Thermoid

Powerflex Rotary Hose • Trioflex Slim-Hole Rotary Hose • Mud-Flo Slush Pump Hose • Flexible Discharge Units • F.H.P. and Multiple V-Belts • Oil Country Flat Belting

Wire Line Turn Backs • No-Wip Line Savers • Stuffing Box Rings • All Types of Hose • Molded Specialties • Brake Blocks

Thermoid Company • Offices & Factories: Trenton, N. J., Nephi, Utah

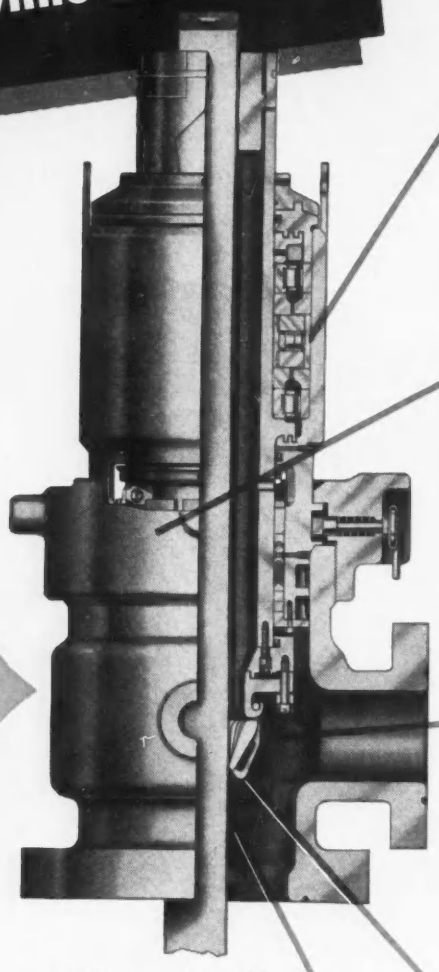
THE MOST EFFICIENT, MOST VERSATILE UNIT for continuous pressure control while drilling!

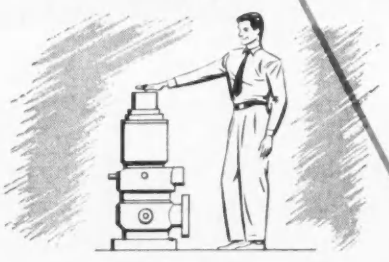
The Shaffer Combination Rotating Blowout Preventer and Stripper

... is unequalled for all-around pressure control because it combines—in *one* compact unit—the many features needed for safe, simplified drilling under pressure. What's more, no special drill pipe or kellys are required—*it works equally well with all standard drill-string hook-ups!*

The Shaffer Combination Rotating Blowout Preventer and Stripper is *completely automatic* in its action. Pressure emergencies just can't happen too fast, for this unit is *always* sealed off around the drill string while pipe is in the hole ... *always* ready to control pressure surges as soon as they occur—without manual attention.

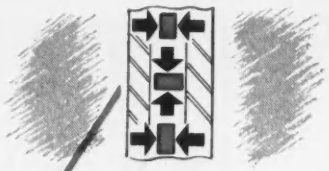
Check over the unique features outlined at right. Then, before you purchase *any* pressure control equipment, get the *complete* story on the Shaffer Combination Rotating Blowout Preventer and Stripper. It's the most *efficient*, most *positive*, most *versatile* pressure control unit available today!





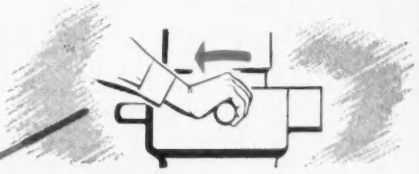
AMAZING COMPACTNESS

Space-saving compactness of the Shaffer Combination Rotating Blowout Preventer and Stripper reduces both vertical and horizontal space requirements, and permits installation even under the most difficult space limitations. Even the flow connections are built directly into the body, thus simplifying hook-ups and eliminating need for spools or other equipment for overflow connections!



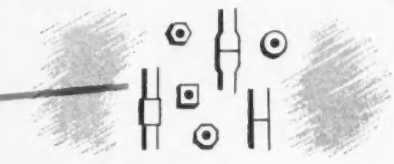
UNUSUALLY LONG LIFE

The Stripper Assembly rotates freely *with* the kelly—not one inside the other—thus, there is virtually no wear on the rubber. This reduces maintenance, assures a pressure-tight seal and maximum safety. In addition, the bearing assembly upon which the unit rotates has separate thrust and radial bearings to withstand any combination of loads due to high pressures and high-speed drilling. Bearings are lifetime prepacked with heat-resisting lubricant.



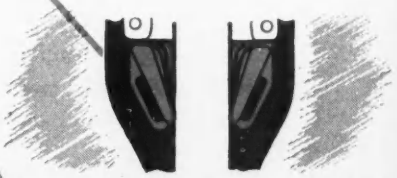
QUICK RELEASE

Bits and reamers can be passed through the unit with maximum ease, safety and simplicity. Simply pull a spring latch, rotate the bonnet 1/6 turn and the entire internal mechanism as a unit can be withdrawn to permit removal of the bit or reamer. When going back into the hole, simply reverse the operation. It's as simple as that!



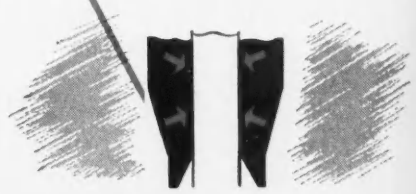
SEALS ANY SHAPE, VARYING DIAMETERS

The Stripper Rubber expands and contracts *automatically* to fit the various shapes and diameters in the drill string (excepting only such abnormally large diameters as the bit and reamer). It seals off around any shape—square, hexagonal and octagonal kellys ... as well as the varying diameters of couplings, tool joints, subs, drill collars and pipe, whether upset, flush or coupled. *No manual adjustment is necessary!*



STEEL PROTECTED STRIPPER RUBBER

A patented expandable steel barrier of flexible steel latches prevents the Stripper Rubber from extruding either by high pressure or by pulling large diameters through it. Yet full flexure of the rubber is assured at all times!



SEALS CONTINUOUSLY

A pressure-tight seal is maintained at *all* times without need for applying mechanical or hydraulic pressure of any kind from the outside ... and the seal is *self-adjusting* to the varying shapes and sizes in the drill string. The operator can *drill* under pressure, and can also *strip* pipe in and out of the well under pressure—*all without adjustments or changes in the unit!*

28 years OF OIL TOOL LEADERSHIP

SHAFFER

HIGH PRESSURE DRILLING AND CONTROL EQUIPMENT • FISHING TOOLS THAT EXCEL

SHAFFER TOOL WORKS, Brea, California • California Service Shops: Santa Fe Springs and Taft
HOUSTON, TEXAS, 6006 Navigation Blvd. • ODESSA, TEXAS, 1925 West Second Street
OKLAHOMA CITY, OKLAHOMA, Acme Oil Tool Company, 1001 S. E. 29th Street
CASPER, WYOMING, Shaffer Tool Works, Post Office Box 1788
EXPORT SALES OFFICE: Shaffer Tool Works, 500 Fifth Avenue, New York, N. Y., U.S.A.

See pages 4433 to 4496 of your 1950 Composite Catalog for helpful data on Shaffer products. Or send for your free copy of the 1950 Shaffer Catalog!

SAFETY FIRST SAFETY FAST

With A Bucyrus-Erie Bulldozer on Fire Control

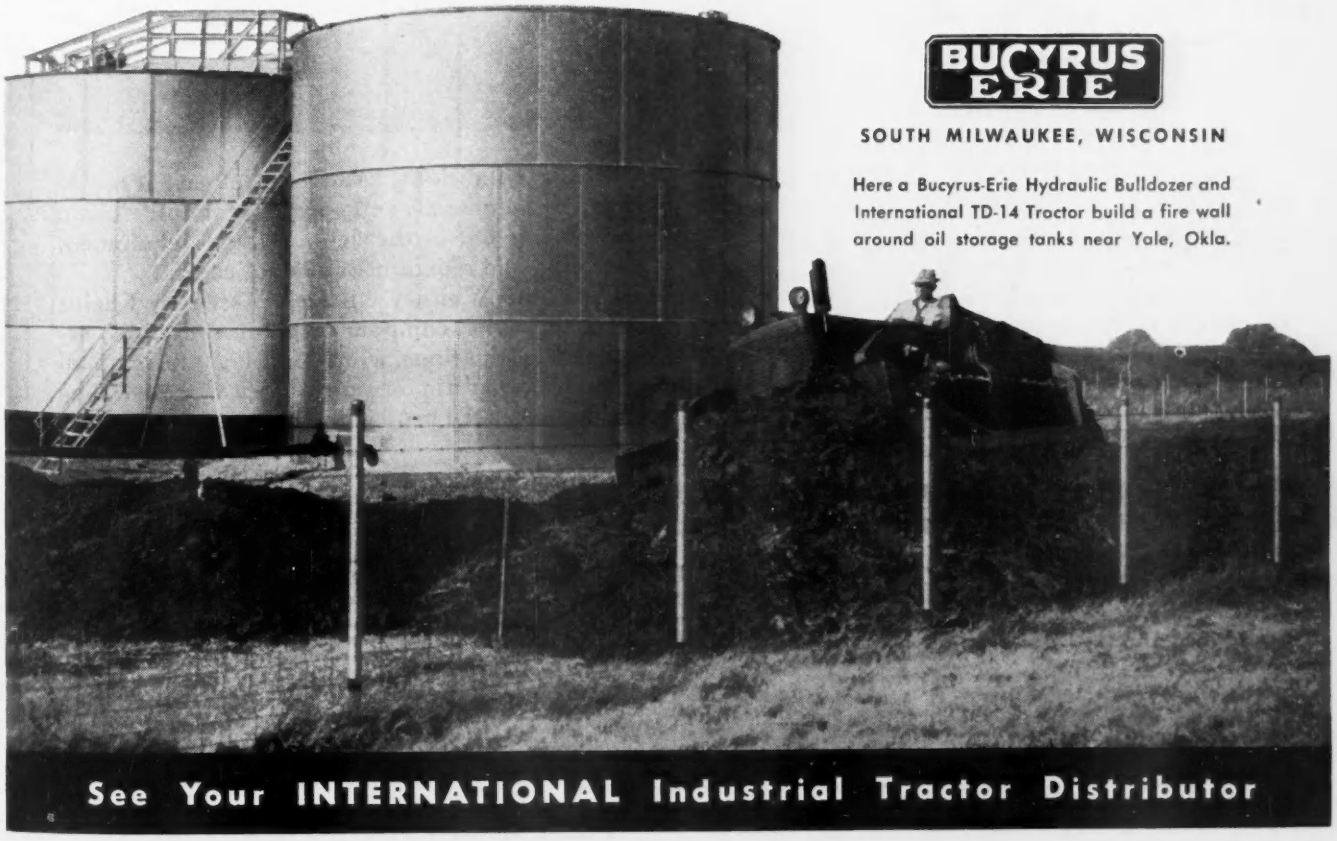
ALERT to the ever-present threat of fire, safety-minded oil field operators utilize the latest and best fire prevention and control methods.

That's why fast-working, Bucyrus-Erie Bulldozers and Bullgraders fill an important spot as safety patrol units. Matched to powerful International crawler tractors, these hard-hitting front ends build fire walls around storage tanks, dig trenches, clean up brush, punch out emergency roads — move dirt where it's needed when it's needed.

Fast blade work is easy . . . a single lever handles all four blade positions — raise, hold, lower, float.

And one man can make Bullgrader angle and tilt adjustments in a few minutes without special tools. Another speed-up feature is the scientifically curved blade. It doesn't just push — it *rolls* dirt along — the fastest, cheapest, easiest way to move a load.

Fire control is just one of the many oil field jobs tailor-made for Bucyrus-Erie hydraulic and cable Bulldozers and Bullgraders. Your International Industrial Tractor Distributor can give you full details. 271751



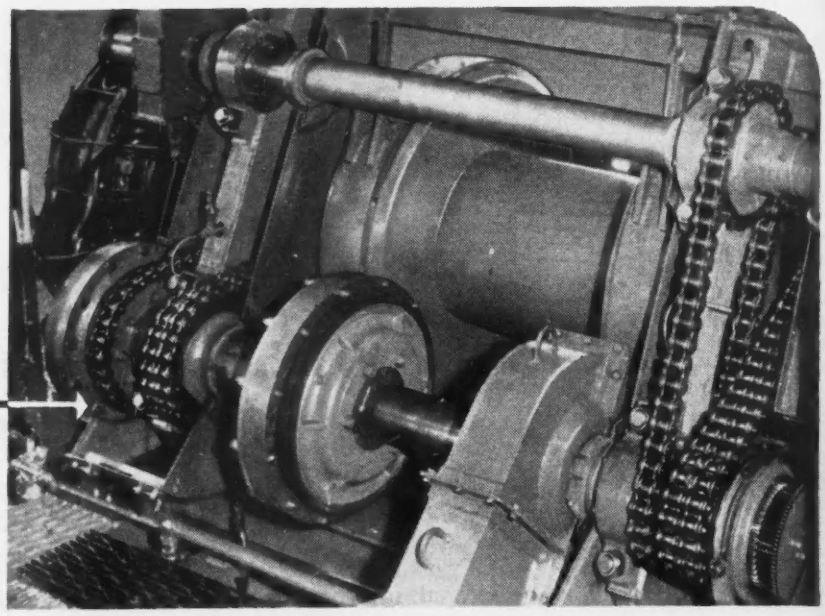
BUCYRUS ERIE

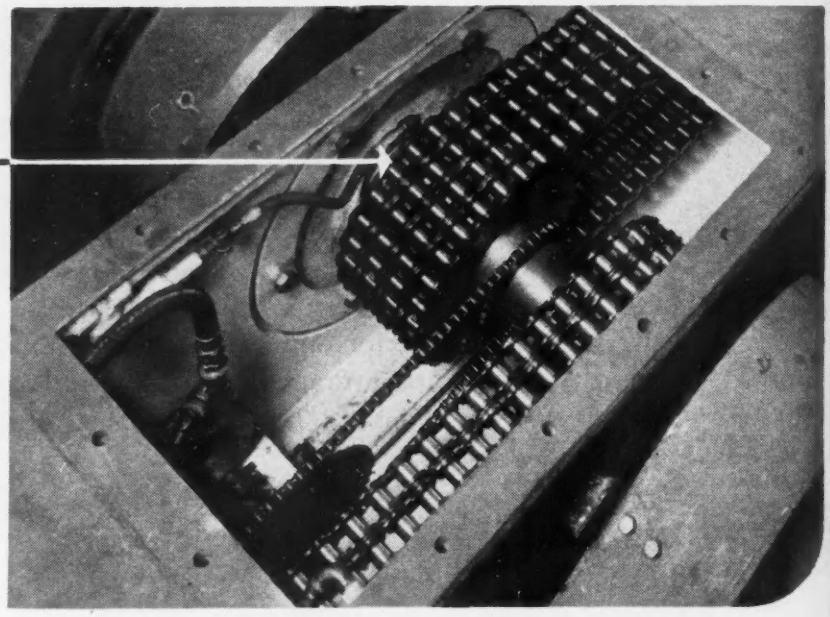
SOUTH MILWAUKEE, WISCONSIN

Here a Bucyrus-Erie Hydraulic Bulldozer and International TD-14 Tractor build a fire wall around oil storage tanks near Yale, Okla.

See Your INTERNATIONAL Industrial Tractor Distributor

From Drawworks to Compounding Transmissions





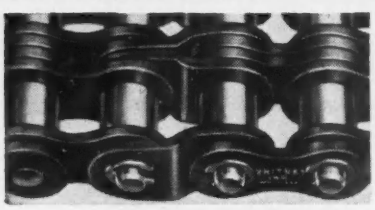
WHITNEY OIL FIELD ASSEMBLY CHAINS Keep Production Up, Cut Idle Equipment Time Down

Whitney Oil Field Assembly Chains on your oil well drilling equipment insure you of top operating speeds and dependable, long-lived performance that reduce costs, boost production . . . that's been the experience of leading machinery designers, manufacturers and users.

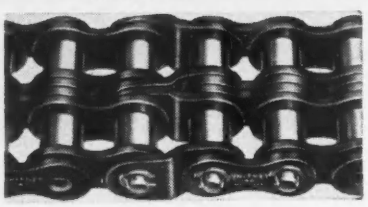
Quality constructed of heat-treated, alloy steel parts, Whitney Chain Drives deliver full machine output . . . supply high transmission efficiency, day in, day out, without breakage under the toughest field conditions. And remember, Whitney *snap-ring construction* and *offset links* simplify chain adjustments out in the field . . . keep equipment operating and reduce maintenance costs.

Look into Whitney Oil Field Assembly Chains for drawworks, compounding transmissions, selective transmissions, winches, rotary tables, spudders and other applications. They will save time and money, keep production up.

Compare These Maintenance Reducing Features



Whitney Lacing Arrangement makes field adjustment quick and easy...all you do is remove one or more offset links and your equipment is ready to keep on working.



Whitney Snap-Ring construction eliminates cotter pins . . . provides positive fastening. Snap-Rings are easy to remove, easy to install.

Whitney Chain Company

230 Hamilton Street, Hartford 2, Conn.

WHITNEY OIL COUNTRY WAREHOUSES

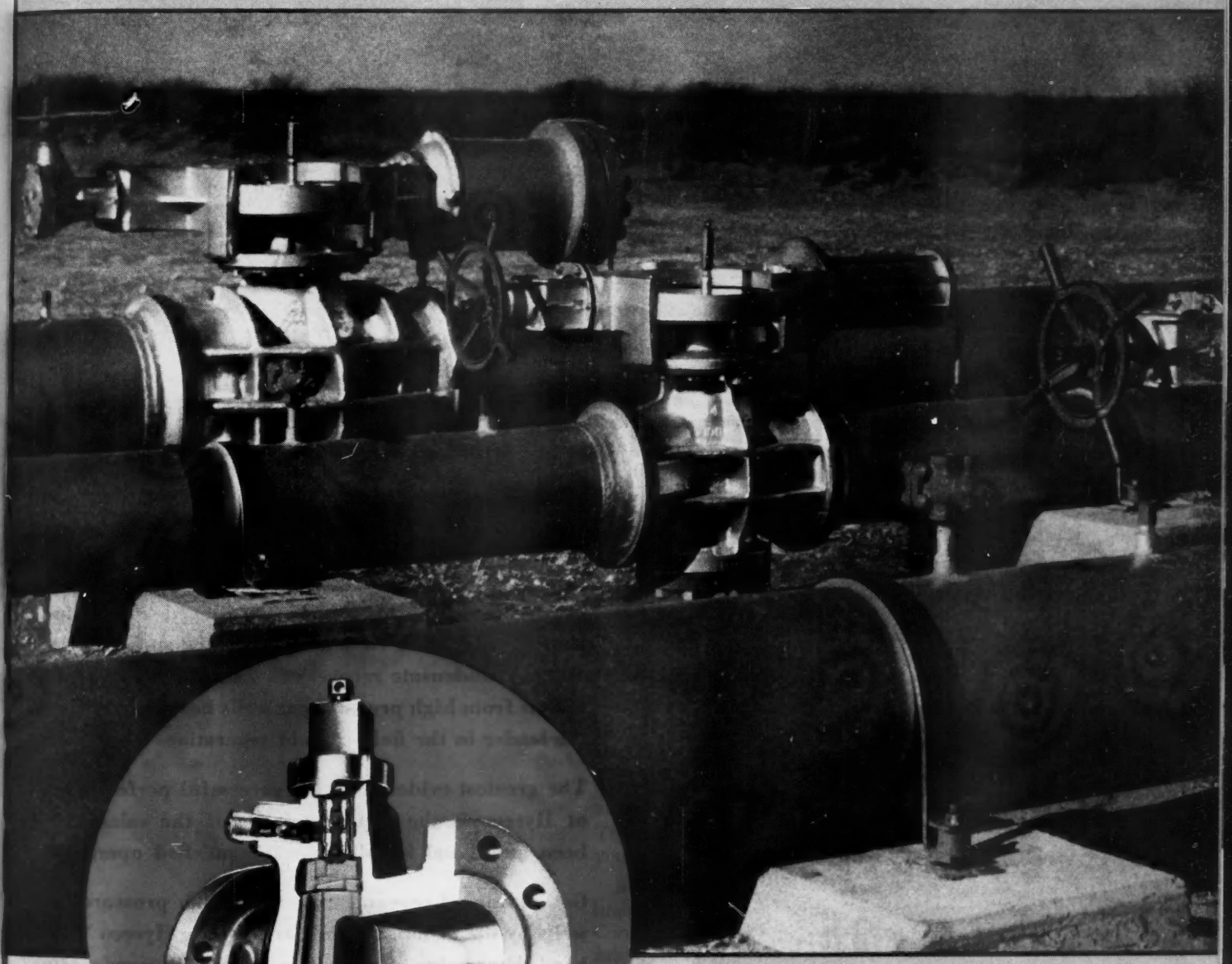
WHITNEY CHAIN COMPANY
5400 Pacific Blvd., Los Angeles, Calif.

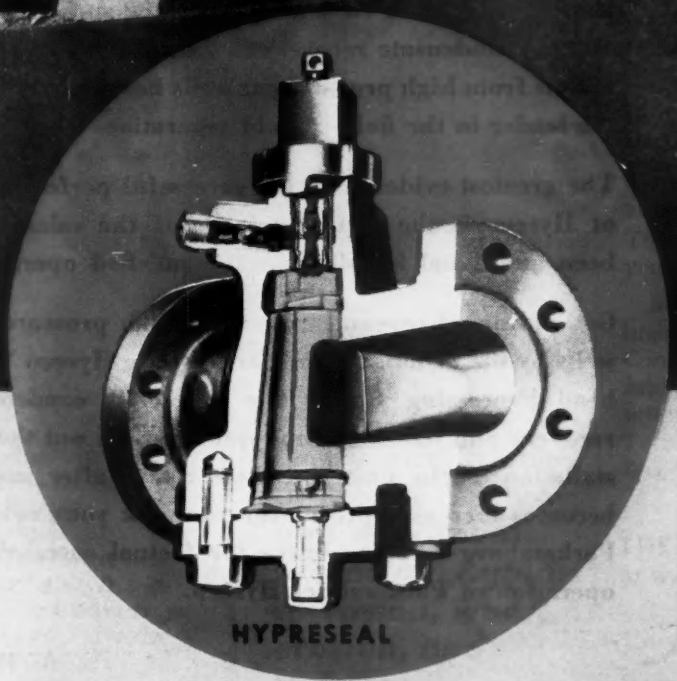
WHITNEY CHAIN COMPANY
2914 Taylor Street, Dallas, Texas

Automatic Protection

for natural gas pipe lines

Many of the major natural gas transport pipe lines now in service are protected against the effects of line break by Nordstrom valves equipped with the exclusive automatic closing system. Positive in operation under line break conditions but not affected by normal operating pressure changes. Simple – no complicated or delicate devices required. Just a valve with cylinder, a small buried pressure tank, and control piping connections. Isolates line breaks automatically in minutes or less instead of hours. Ask for information.





HYPRESEAL

Nordstrom valves are available with all standard types of power operation—electric, simple or automatic cylinder, or pneumatic motor. Select the type best suited for the requirements of your particular installation.

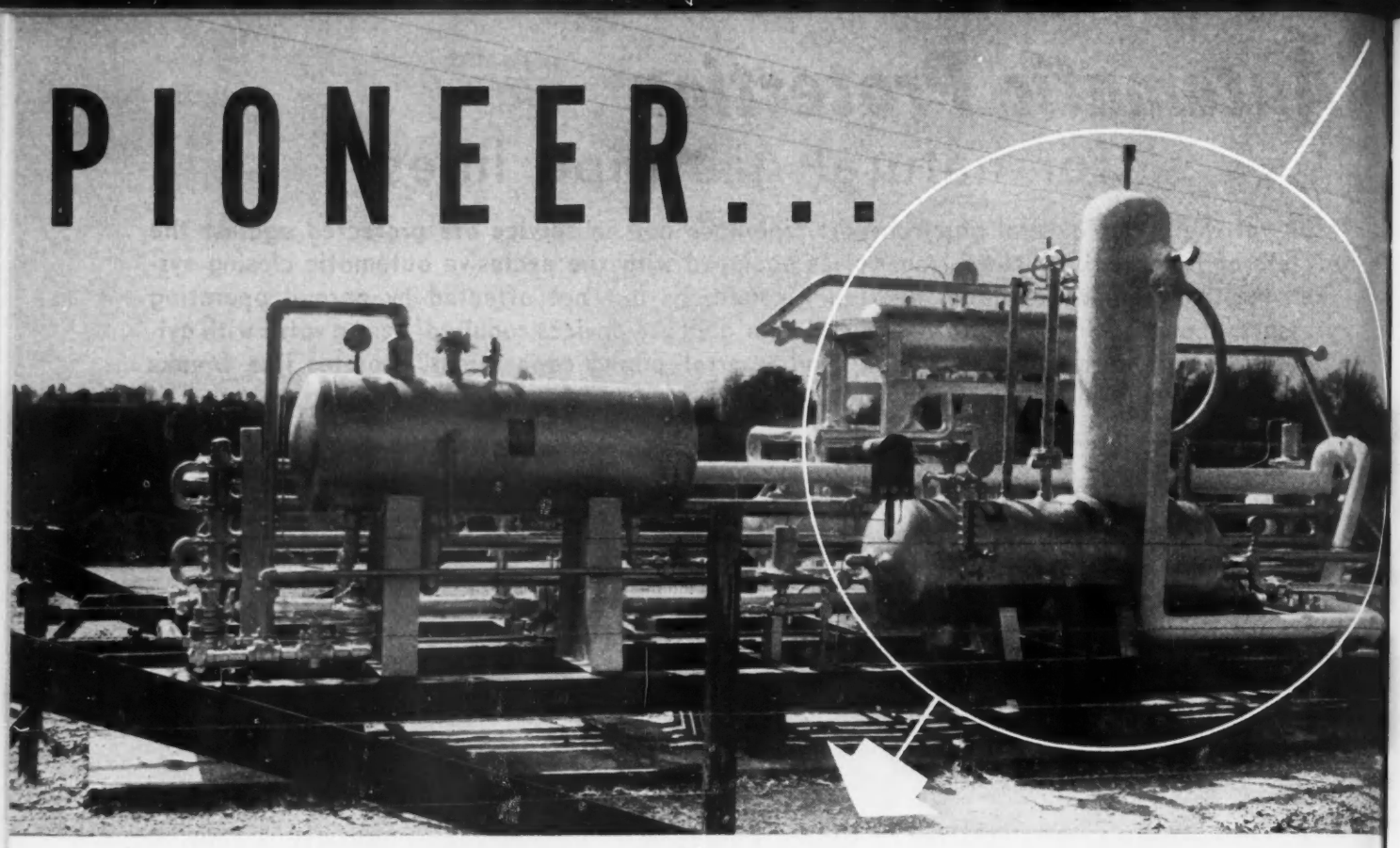
ROCKWELL MANUFACTURING COMPANY

400 N. Lexington Ave., Pittsburgh 8, Pa.

Offices in all principal cities

Nordstrom VALVES

PIONEER...



AND STILL THE LEADER IN *COLD SEPARATION*

PARKERSBURG
HYRECO
INCREASING CONDENSATE RECOVERY ON SCORES OF WELLS

PARKERSBURG RIG AND REEL COMPANY
Parkersburg, West Va.

● **The advantages of cold separation became commercially practical for the first time when Parkersburg introduced the Hyreco Wellhead Processing Unit in mid-1950. Its efficient performance . . . increased condensate recovery . . . substantial boost of profits from high pressure gas wells has made Hyreco the leader in the field of cold separation.**

The greatest evidence of the successful performance of Hyreco is the fact that 80% of the sales have been additional installations for satisfied operators.

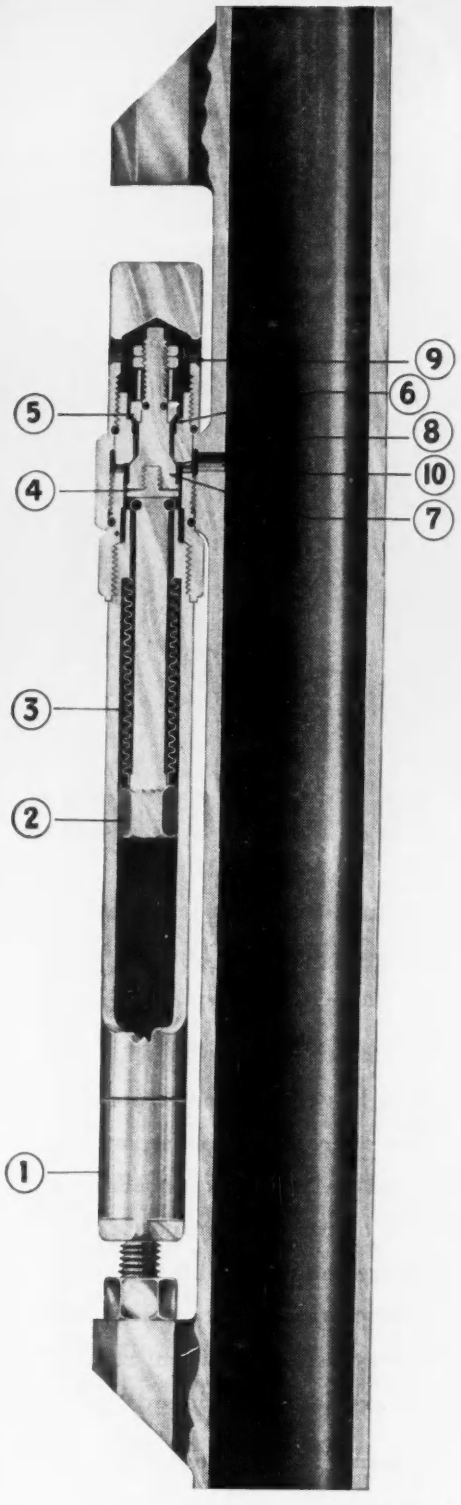
Get additional revenue from your high pressure gas wells by the installation of Parkersburg Hyreco Wellhead Processing Units. The increased condensate recovery and added income quickly pays out the installation of the unit and then month after month becomes increased profits for you. Ask your nearest Parkersburg Representative for factual cases about operation of Parkersburg Hyreco.

No. 5117

PARKERSBURG
PRESSURE EQUIPMENT

HORIZONTAL AND VERTICAL SEPARATORS • HYRECO • HYDRACEPTER • SCRUBBERS • TREATERS • HEATERS

Manufactured in Houston, Texas



1. CHARGING MECHANISM
2. STEM GUIDES
3. BELLOWS
4. PISTON
5. UPPER VALVE FACE
6. UPPER VALVE SEAT
7. LOWER VALVE FACE
8. LOWER VALVE SEAT
9. INLET PORTS
10. OUTLET PORT

Every part made of Monel to give you maximum protection against corrosion, wear, erosion, and fatigue.

Here's a valve that's said to be the first "direct pressure" operated bellows valve designed to operate in accordance with accepted theories of efficient gas lift. Made by Bryan Gas Lift Equipment Company, it works from a low pressure at the top of the well to higher pressures as depth and lift increase.

Design features of this Bryan valve include: Dual operation; works on reverse or direct pressure... No backflow can enter the casing once the annulus is unloaded ...Valve works in cooperation with, not opposed to, gas laws... No check valves required... Will unload to bottom; no "compulsory skimming"... Lower gas-oil ratios.

In the new Bryan Direct Pressure Gas Lift Valve, all-Monel construction makes

CORROSIVE CRUDES EASIER TO HANDLE

Another big feature is the all-Monel® construction. Like many other manufacturers of oil field and refinery equipment, Bryan knows the value of Monel in making equipment more resistant to corrosion, wear, erosion, rust and fatigue. Value that helps *you* get longer life and more efficient operation in the field.

Years of service in unusually corrosive areas have proved the superiority of Monel for use under conditions that rapidly weaken and destroy less rugged metals.

Bryan, for example, has been making all-Monel valves for about 20 years. They're sold on Monel. And no wonder! Bryan valves have been in successful operation in highly corrosive wells for more than 10 years without failure.

Write direct to the Bryan Gas Lift Equipment Company, P. O. Box 3233, Fort Worth, Texas, for catalog and further details of their gas lift equipment.

Remember, though, that Monel is hard to get right now because so much is needed for defense production. That's why you may have to wait for the Monel equipment you want.

But you don't have to wait to find out how Monel helps improve oil field operations. Our booklet *Controlling Corrosion in Petroleum Production Equipment* covers the subject fully. It tells you, too, how to get expert advice on the selection of materials, and contains a list of valuable Technical Bulletins that are available on request. Write us for your copy.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

EMBLEM OF SERVICE
INCO
TRADE MARK

MONEL... YOUR PARTNER IN PROGRESS

Returned to POLICYHOLDERS

The Texas Employers' Insurance Association has saved and returned to policyholders $29,599,234 in the form of Dividends and Guaranteed Cost Discounts, through 1950.

Most of these savings have been made possible by the Association's low operating expense, which has averaged about one-half the expense ratio allowed in the Texas Workmen's Compensation rates. Other savings were made possible through Safety Engineering. Association Safety Engineers have worked with employers to help them reduce accidents and thereby earn larger dividends.

More than seven thousand Texas firms are enjoying the savings and specialized service afforded by the Texas Employers' Insurance Association. Are you? If not, call or write the Association office nearest you.

OTHER COVERAGES

Texas firms and individuals with preferred-type risks are offered the same DIRECT SERVICE, plus a SAVING on FIRE • AUTOMOBILE • LIABILITY CARGO and other ALL-RISK lines

by

EMPLOYERS CASUALTY CO.

A Participating Stock Company Companion to the Association

Largest Writer of WORKMEN'S COMPENSATION INSURANCE *in Texas*

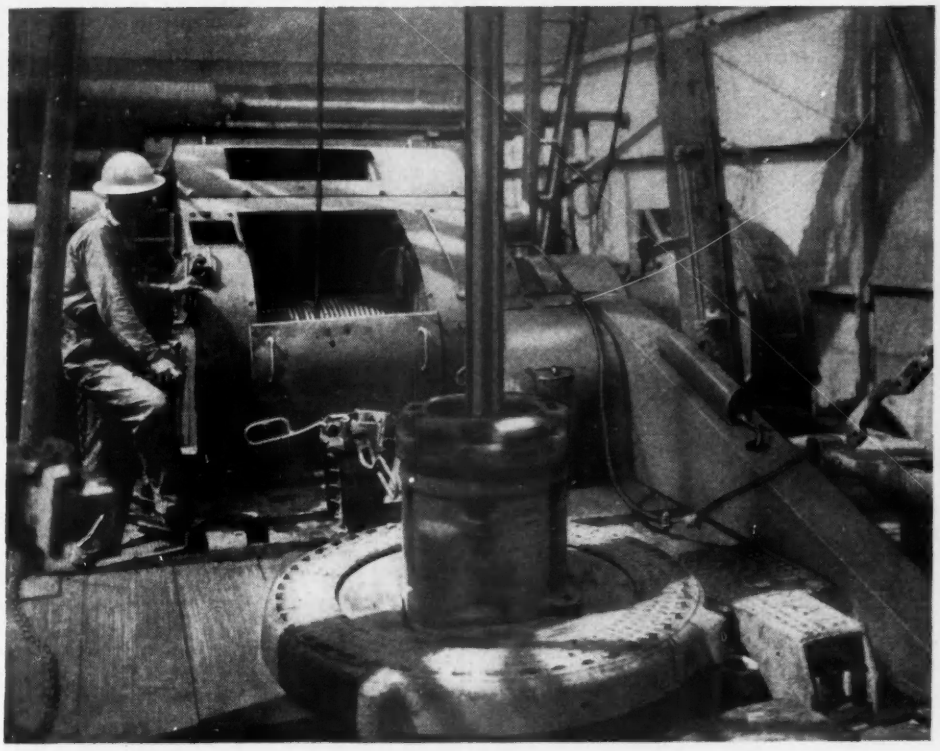
HOMER R. MITCHELL, *Chairman of the Board* A. F. ALLEN, *President*

Service Offices: ABILENE • AMARILLO • AUSTIN • BEAUMONT • CORPUS CHRISTI • DALLAS • EL PASO FORT WORTH • FREEPORT • GALVESTON • HARLINGEN • HOUSTON • LUBBOCK • LUFKIN • MIDLAND PORT ARTHUR • SAN ANGELO • SAN ANTONIO • SHERMAN • TYLER • WACO • WICHITA FALLS

TEXAS EMPLOYERS INSURANCE ASSOCIATION

HOME OFFICE - DALLAS, TEXAS

WIRE ROPE



ROEBLING ALL-PURPOSE SLINGS with the Tapered Sleeve Splice come to you ready for the job. They cost less than tucked splices . . . have the full strength of the rope. Send for the full story.

In the oil fields Roebling "Blue Center" Preformed is tops for service and savings

"BLUE CENTER" STEEL wire rope is an exclusive Roebling development. It has to pass the most stringent tests for strength, fatigue and abrasion resistance . . . gives rope the extra long life that spells important economies. Besides, Roebling Preforming assures you top performance on the job. "Blue Center" Preformed is easy to handle . . . has better spooling qualities . . . reduces vibration and whipping.

Roebling makes a complete line of wire rope . . . makes the right grade, and construction for every installation. Have your Roebling Field Man help choose the *right* rope for your equipment. Get his advice on the correct use and maintenance of wire rope. It is based on performance records on thousands of installations. John A. Roebling's Sons Company, Trenton 2, New Jersey.

ROEBLING

DISTRIBUTED BY THE NATIONAL SUPPLY COMPANY
REPUBLIC SUPPLY COMPANY

THE NIGHT BEFORE CHRISTMAS

by Jolly Saint "VIC"

'Twas the night before Christmas and right down the line
Not a drop was there leaking, even one at a time.
All sections were "locked" and "buttoned-up" tight
With Victaulic Couplings that made 'em just right.

All Elbows and Tees stayed right in their groove
For the Victaulic Method each fitting did prove.
With the world's best system for making ends meet
Each pipe and each fitting was tight in its seat.

Now all of this piping so good and so quick
Was the work of none other than jolly Saint "Vic"
So for better connections in the year '52
You'd better let "Vic" do that piping for you.

VICTAULIC COMPANY OF AMERICA
1100 Morris Avenue, Union, N. J.
Mailing Address: Box 509, Elizabeth, N. J.
Phone: Elizabeth 4-2141
Victaulic Inc., 727 W. 7th St., Los Angeles 14, Calif.
Victaulic Company of Canada, Ltd., 406 Hopewell Ave., Toronto 10
For Export outside U.S. & Canada: PIPECO Couplings & Fittings, Pipe Couplings, Inc., 30 Rockefeller Plaza, New York 20, N.Y.
27TH VICTAULIC YEAR

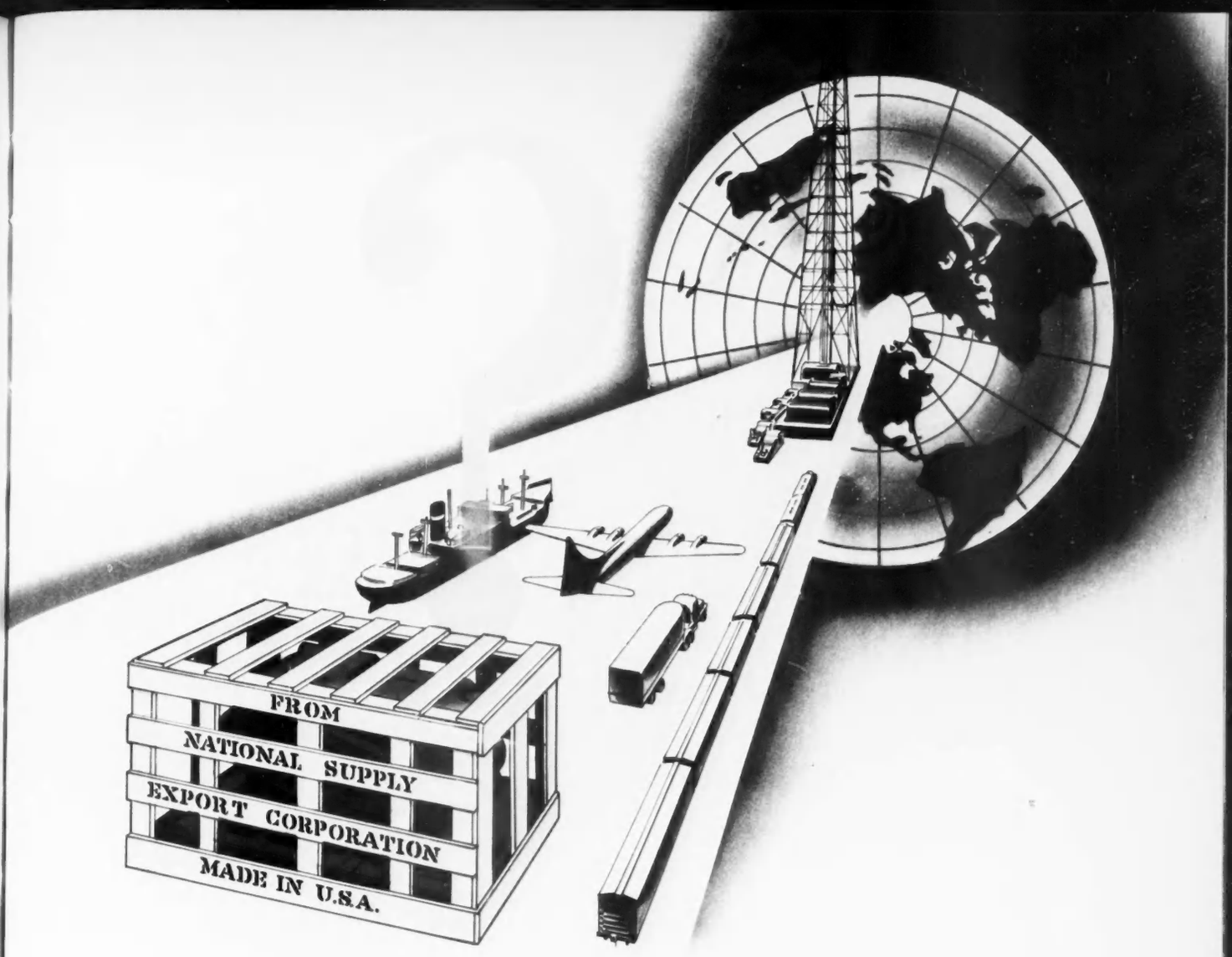
The easiest way to make ends meet
VICTAULIC
PIPE COUPLINGS AND FITTINGS

Copyright 1951, by Victaulic Co. of America

THE OIL MAN'S Calendar

DEC.	
2– 5	American Institute of Chemical Engineers, Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.
11–12	Interstate Oil Compact Commission, Winter (Annual) Meeting, Hotel Marion, Little Rock, Ark.
26–31	American Association for the Advancement of Science, Annual Meeting, The Bellevue-Stratford, Philadelphia.
1952	
JAN.	
8– 9	Pipe Line Contractors Association, Fourth Annual Convention, Shamrock Hotel, Houston.
17–19	Southwestern Legal Foundation, Third Annual Institute on the Law of Oil and Gas and Taxation, Dallas.
21–25	American Institute of Electrical Engineers, Winter General Meeting, Hotel Statler, New York.
23–24	National Industrial Conference Board, Inc., General Session—All Associates, Waldorf-Astoria Hotel, New York.
FEB.	
28–29	American Association of Petroleum Geologists, Rocky Mountain Section, Annual Meeting, Hotel Utah, Salt Lake City.
MAR.	
5– 7	American Petroleum Institute, Division of Production, Southwestern District, Spring Meeting, Washington-Youree Hotel, Shreveport.
10–13	National Electrical Manufacturers Association, Edgewater Beach Hotel, Chicago.
11–14	National Association of Corrosion Engineers, Annual Conference and Exhibition, Municipal Pier and Galvez Hotel, Galveston, Tex.
19–21	American Petroleum Institute, Mid-Continent District, Division of Production, Annual Meeting, Broadview Hotel, Wichita, Kans.
20	National Industrial Conference Board, Inc., General Session—All Associates, St. Francis Hotel, San Francisco.
23–27	American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, Society of Exploration Geophysicists, Joint Annual Meeting, Biltmore Hotel, Los Angeles.
APRIL	
2– 4	American Petroleum Institute, Eastern District, Spring Meeting, William Penn Hotel, Pittsburgh.
8–10	Southwestern Gas Measurement Short Course, University of Oklahoma, Norman, Okla.
21–23	American Petroleum Institute, Division of Transportation, Pipe Line Conference, The Blackstone, Ft. Worth, Texas.
24–25	American Petroleum Institute, Division of Production, Rocky Mountain District, Gladstone Hotel, Casper, Wyo.
MAY	
5– 7	American Geophysical Union, 33rd Annual Meeting, National Academy of Sciences, National Research Council, Washington, D. C.
12–13	American Association of Petroleum Geologists, Regional Meeting, Tulsa.
15–16	American Petroleum Institute, Division of Production, Pacific Coast District, Spring Meeting, Biltmore Hotel, Los Angeles.
26–28	American Gas Association, Production and Chemical Conference, Hotel New Yorker, New York.
JUNE	
9–14	American Petroleum Institute, Division of Production, Mid-year Standardization Conference, Brown Palace Hotel, Denver.

Nomads' Chapter monthly meeting: **Los Angeles**, second Wednesday, Jonathan Club, Jack Ballagh, Secretary. **Houston**, second Monday, Ye Olde College Inn, Harry E. Estes, Secretary. **Dallas-Fort Worth**, first Monday, Greater Dallas Club, C. J. Berlin, Secretary. **Tulsa**, Hotel Tulsa, E. L. Thomas, Secretary. **New York**, first Monday, Louis Sherry's, E. T. Landgraff, Secretary.



DESTINATION?

OIL COUNTRY—throughout the world—is the destination of National Supply's drilling and pumping equipment.

The National Supply Company was founded over a half-century ago to provide the petroleum industry with machinery and operating supplies. Today, the completely integrated facilities of National Supply produce "National Blue" oil field machinery, engineered for the dependable service and long life which have been proved by performance in the United States, Canada, the Middle East, Central and South America . . . wherever oil is produced in commercial quantities.

What are *your* oil field requirements? National Supply's complete line of rigs, pumping units, Diesel engines and auxiliary equipment and parts, as well as Spang oil country tubular products, will meet any conditions. Our purpose is to serve you—to help you save time and money when drilling and producing oil. Contact your National Supply representative, or check with your nearby National Supply Store for information.

THE NATIONAL SUPPLY COMPANY

GENERAL SALES OFFICES: TOLEDO, OHIO

NATIONAL BLUE PRODUCTS

Announcing

SPANGWELD DRILL PIPE

. . . A WELDED COMBINATION OF PIPE AND TOOL JOINT

a new product . . .

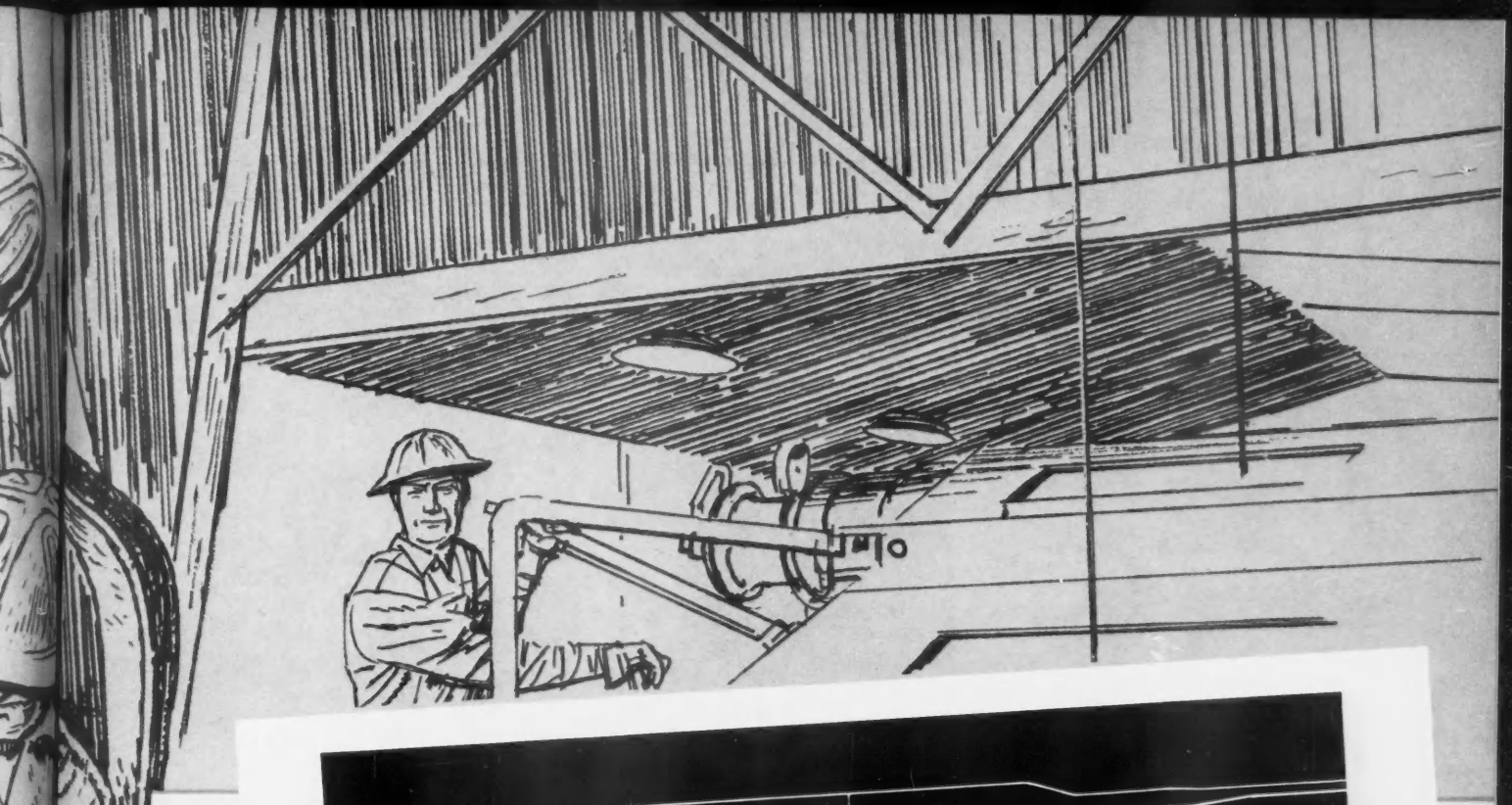
and another progressive step in the development of oil country tubular goods—SPANGWELD Drill Pipe is the only welded combination of Drill Pipe and Tool Joint produced under the complete control of one experienced manufacturer of pipe and joints —National Supply.

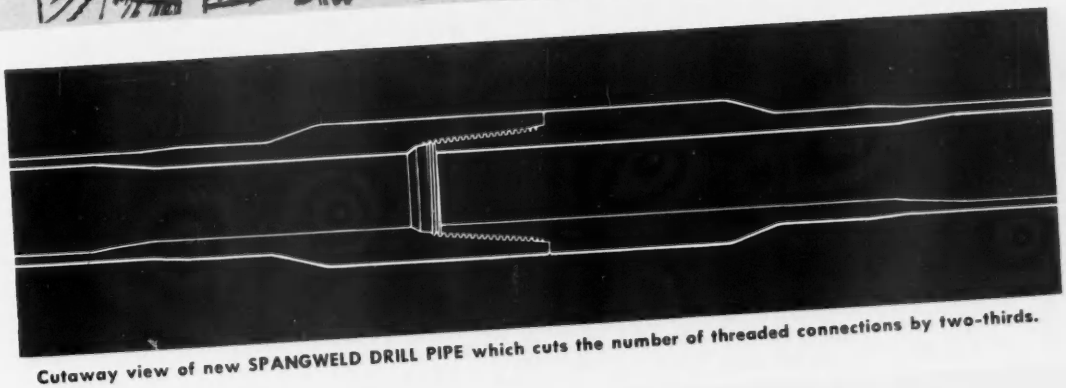
The introduction of SPANGWELD is a natural result of the continuing study by National Supply of the improvement of Tool Joints, plus the years of experience of the Spang-Chalfant Division in the production of Drill Pipe.

SPANGWELD is a logical companion of the service proved Shrink Thread Drill Pipe and Tool Joints pioneered under the SPANG label.

SPANGWELD, like SPANG Double Seal Shrink Thread Drill Pipe and Tool Joints, is available in a complete range of sizes, to meet varying drilling requirements.

NATIONAL OIL FIELD MACHINERY AND EQUIPMENT • SPANG STEEL PIPE • SUPERIOR & ATLAS ENGINES





Cutaway view of new SPANGWELD DRILL PIPE which cuts the number of threaded connections by two-thirds.

FEATURES AND ADVANTAGES OF NEW SPANGWELD DRILL PIPE

- **Reduces first cost of drilling string.**
- **Reduces threaded elements by two-thirds, and minimizes failure.**
- **Undivided responsibility for the quality of both pipe and tool joint, by a single, experienced manufacturer.**
- **Drill Pipe and Tool Joint are connected by welding, not threads.**
- **Perfect alignment of pipe and joint effected by automatic positioning devices.**
- **Longer joint life under abrasive drilling conditions is assured by hard facing (optional).**
- **Welds are tested by Magnaflux, and the entire assembly by hydrostatic pressure.**
- **Electro-plated threads on tool-joint pins resist initial scoring and galling.**
- **Hard facing can be re-applied in the field when necessary, without fear of warpage.**
- **Streamlined exterior contour of joint reduces turbulence.**
- **Widest range of joint O.D.'s for given pipe diameter; Spangweld offers minimum diameter ratios for slim-hole operations.**
- **Joints made in 22 standard sizes—every diameter and type now in common use.**

Write for your copy of our booklet "How to Make Drill Pipe Last Longer". Address, The National Supply Company, Pittsburgh 30, Pennsylvania.

NATIONAL BLUE PRODUCTS

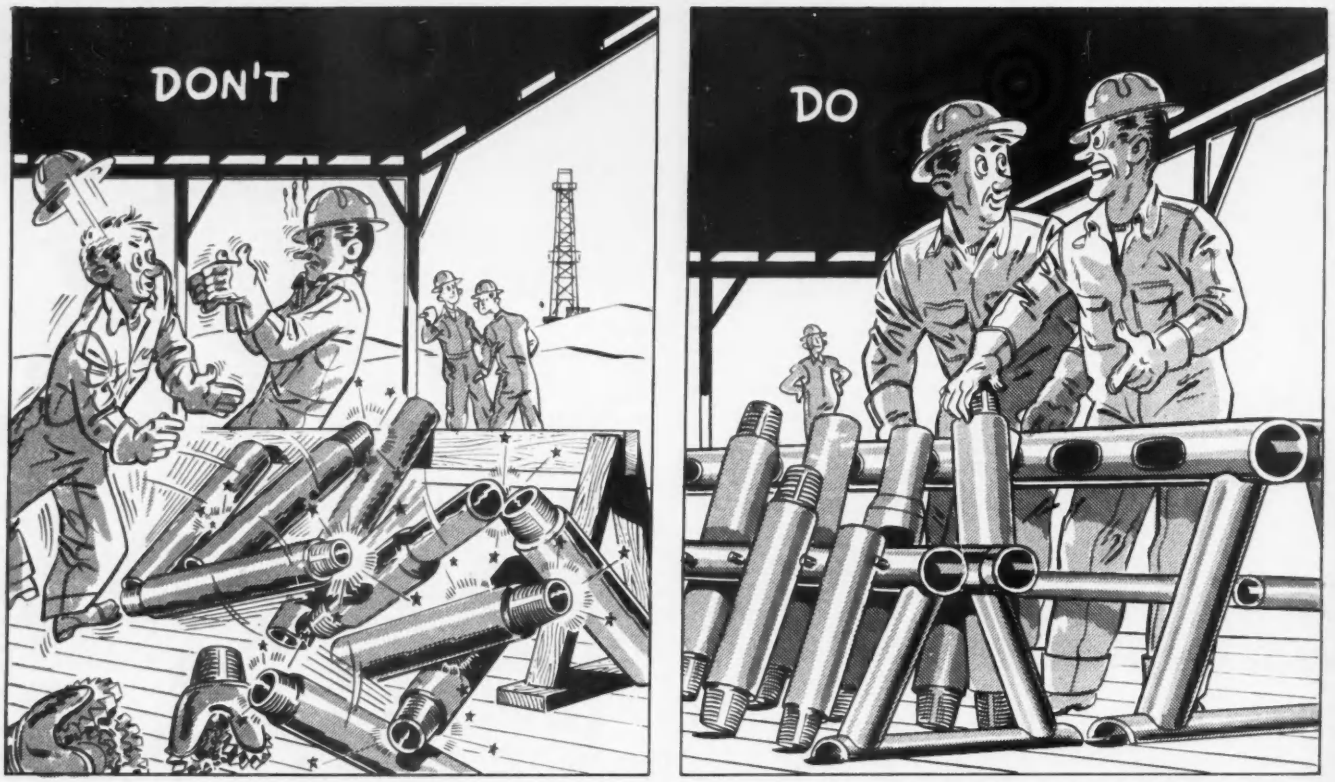
DIVISION TUBULAR OFFICES:

Denver, Colorado • Fort Worth, Texas • Houston, Texas
Los Angeles, California • Pittsburgh, Pennsylvania • Tulsa, Oklahoma
Calgary, Alberta, Canada

THE NATIONAL SUPPLY COMPANY
GENERAL SALES OFFICES: PITTSBURGH, PA.
SPANG-CHALFANT DIVISION

World Oil Graphics

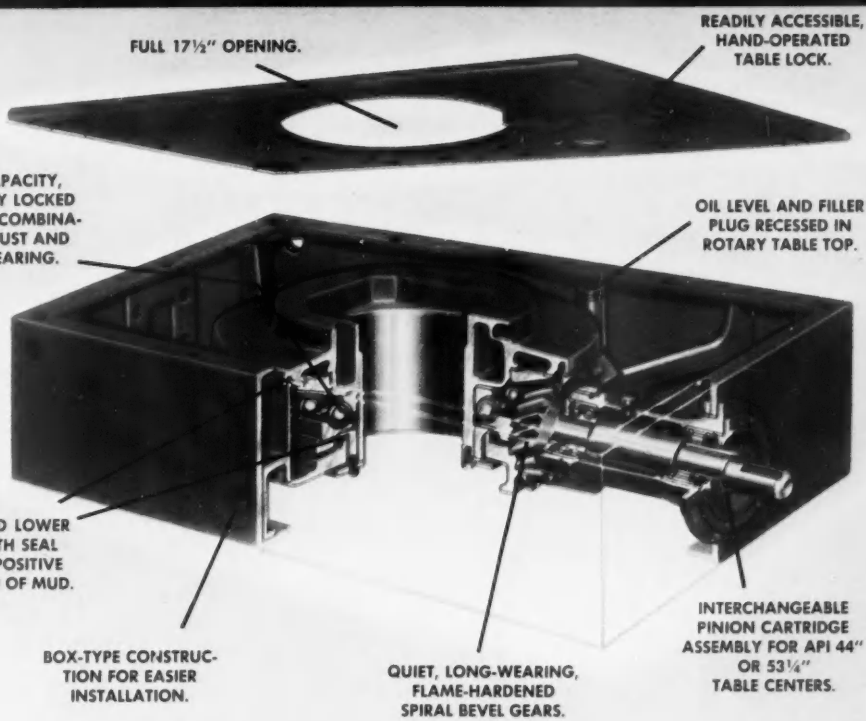
SUB CARE

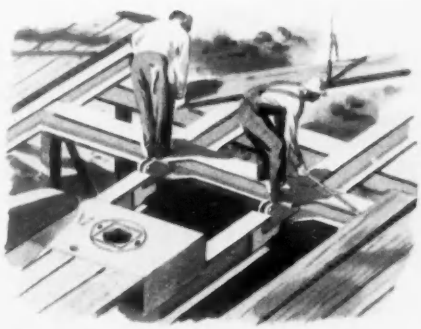


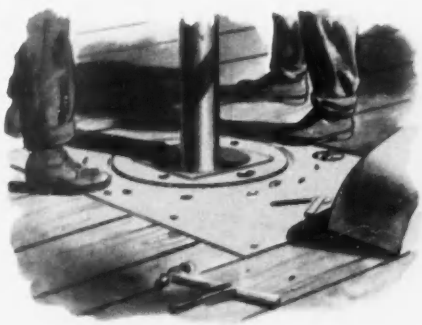
Inexpensive racks which prevent toppling or bunching-up of subs reduce damage to threads and shoulders of this costly and vital equipment.

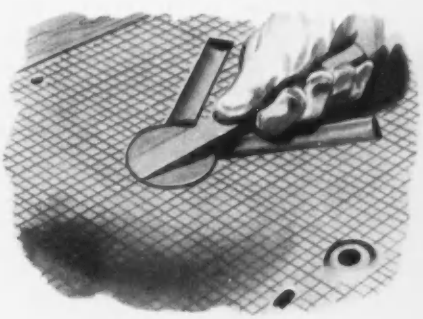
Use of a specially-adapted light dolly protects threads and sharp shoulders, and also makes employes' work easier and safer.

Emsco's New "0-17½" Rotary


FULL 17½" OPENING.
READILY ACCESSIBLE, HAND-OPERATED TABLE LOCK.
HIGH-CAPACITY, POSITIVELY LOCKED BALL-TYPE COMBINATION THRUST AND LOAD BEARING.
OIL LEVEL AND FILLER PLUG RECESSED IN ROTARY TABLE TOP.
UPPER AND LOWER LABYRINTH SEAL ASSURES POSITIVE EXCLUSION OF MUD.
BOX-TYPE CONSTRUCTION FOR EASIER INSTALLATION.
QUIET, LONG-WEARING, FLAME-HARDENED SPIRAL BEVEL GEARS.
INTERCHANGEABLE PINION CARTRIDGE ASSEMBLY FOR API 44" OR 53¼" TABLE CENTERS.







EASIER TO INSTALL

Flooring up around Emsco's new, lightweight, "0-17½" rotary is made simple and easy. Because of its rectangular shape there are no intricate floor patterns to cut. Wood or metal flooring can be set flush with the top and all four sides. Due to its design, the rotary cradles into the substructure, making it easy to bolt into place.

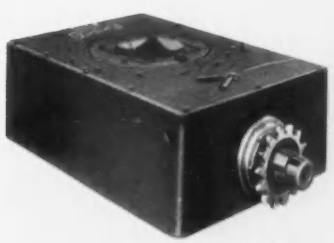
PROVIDES SAFER FOOTING

The flat table top of the "0-17½" is free of all obstructions. This assures safer footing during making up and breaking out operations. Oil level, filler plug and table locking lever are recessed in the top of the rotary table making them easy and convenient to reach, regardless of table setting or flooring arrangement.

ELIMINATES SHOCK DAMAGE

The table locking lever of the "0-17½" rotary locks the body only. As a result, the tonging shock load is not transmitted through the bearings and gears. This eliminates one of the major causes of gear and bearing damage, and assures longer service and lower upkeep. The "0-17½" is available for API 44" and 53¼" settings. The table opening is a full 17½".

Call CONTINENTAL for detailed information, or write for rotary bulletin F-185.



EMSCO DERRICK & EQUIPMENT COMPANY

Houston, Texas • LOS ANGELES, CALIFORNIA • Garland, Texas

EMSCO D+B

EMSCO

REG. U.S. PAT. OFF.

H 106-F—1951

CONTINENTAL

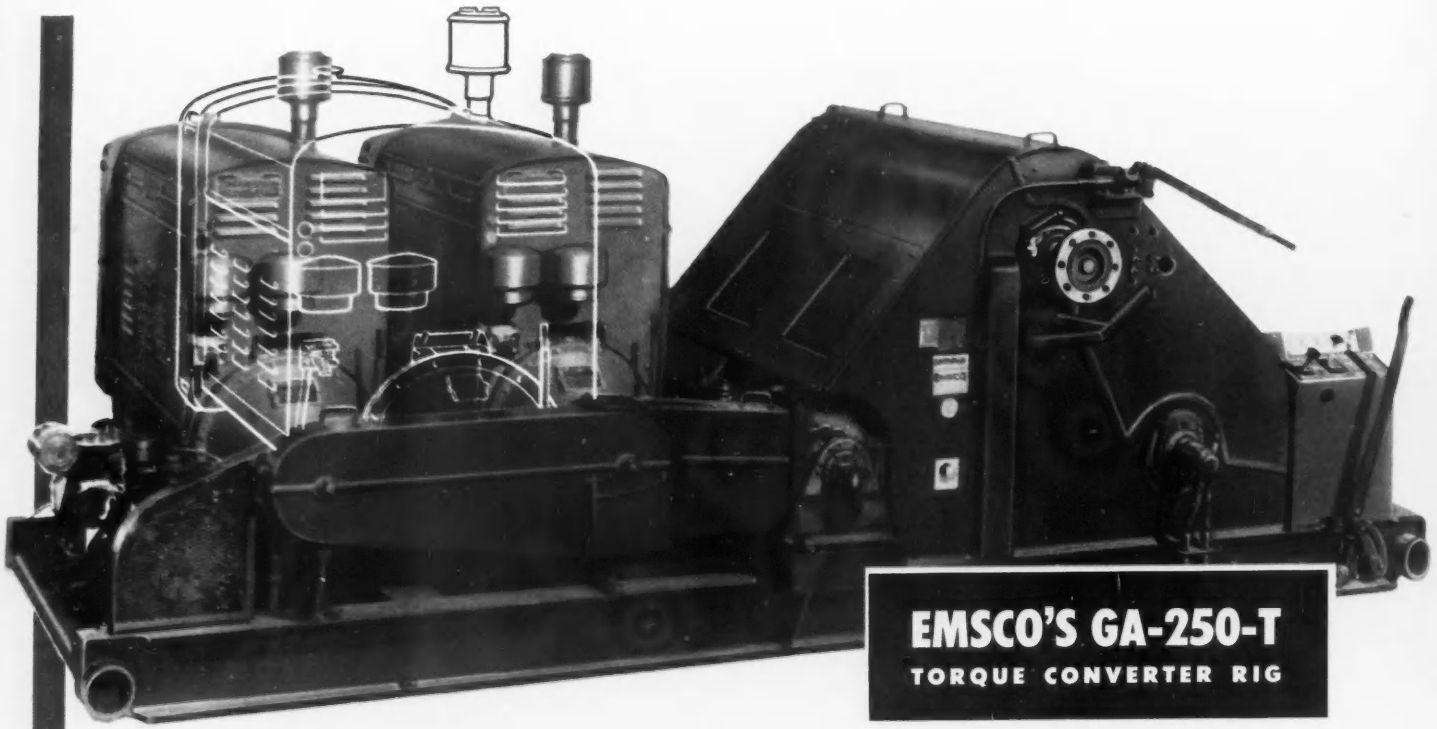
"SERVING THE OIL AND GAS INDUSTRIES"

THE CONTINENTAL SUPPLY COMPANY, General Offices: DALLAS, TEXAS

Export Div.: The Continental Supply Co., Inc., 30 Rockefeller Plaza, New York, N. Y.
The Continental Supply Company, Limited, 216 Lancaster Bldg., Calgary, Alberta

Representatives: Argentina, Bolivia, Brazil, Chile, Colombia, England, Ecuador, Peru, Trinidad, Uruguay, Venezuela

Gives you choice of engines!*



EMSCO'S GA-250-T
TORQUE CONVERTER RIG

*A chain drive between the engine and hydraulic torque converter gives you complete freedom in the selection of engines. *One or two engines,* of proper horsepower, may be used, *regardless of make or rated engine speed, by merely changing the ratio of the drive sprocket.* At any time during the life of the rig, the engine or engines may be *changed, inexpensively,* should operating conditions make a switch in engines desirable. It is never necessary to change the torque converter in changing engine sizes.

Ruggedness and dependability, usually found only in larger and more expensive rigs, are available in Emsco's light-weight, highly portable GA-250-T. The rig's hydraulic torque converter provides an infinite range of operating speeds . . . eliminates shock-loading, and reduces cost of making holes.

Other features which are increasing the popularity of the GA-250-T for shallow to medium depth drilling and deep work-over operations are:

1. Water-cooled brake rims with fully enclosed forced circulating system.
2. Location of all controls at the driller's console, including one-lever control for hoisting speeds, drum clutch and engine throttle.
3. Direct air-operated friction clutches.
4. Reverse drive and neutral brake as standard equipment.
5. Forced feed lubrication of drawworks, selective speed transmission and engine drive.

For fast, safe, low-cost drilling, make Emsco's GA-250-T torque converter rig your first choice. Call CONTINENTAL!

EMSCO DERRICK & EQUIPMENT COMPANY
Houston, Texas • LOS ANGELES, CALIFORNIA • Garland, Texas

EMSCO D+B

EMSCO
REG. U.S. PAT. OFF.

H 106-B— 1951

CONTINENTAL

"SERVING THE OIL AND GAS INDUSTRIES"
THE CONTINENTAL SUPPLY COMPANY, General Offices: DALLAS, TEXAS
Export Div.: The Continental Supply Co., Inc., 30 Rockefeller Plaza, New York, N.Y.
The Continental Supply Company, Limited, 216 Lancaster Bldg., Calgary, Alberta

Representatives: Argentina, Bolivia, Brazil, Chile, Colombia, England, Ecuador, Peru, Trinidad, Uruguay, Venezuela

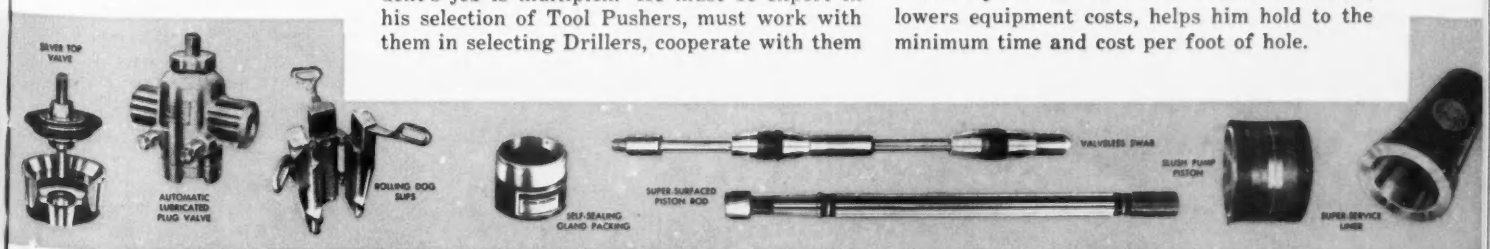
The Drilling Contractor's Superintendent

Nearly 90% of the 44,000 wells to be completed this year, will be drilled by Drilling Contractors. Consider the problems to be solved, the complexities to be faced, and the responsibilities involved in so huge a schedule of operations, and you will gain some idea of the importance of the Contractor's chief field officer . . . the Drilling Superintendent.

A Drilling Superintendent will in some cases supervise fifteen or more drilling rigs representing, in rotary territory, an investment of from 2 to 10 million dollars. He is a drilling expert of long experience.

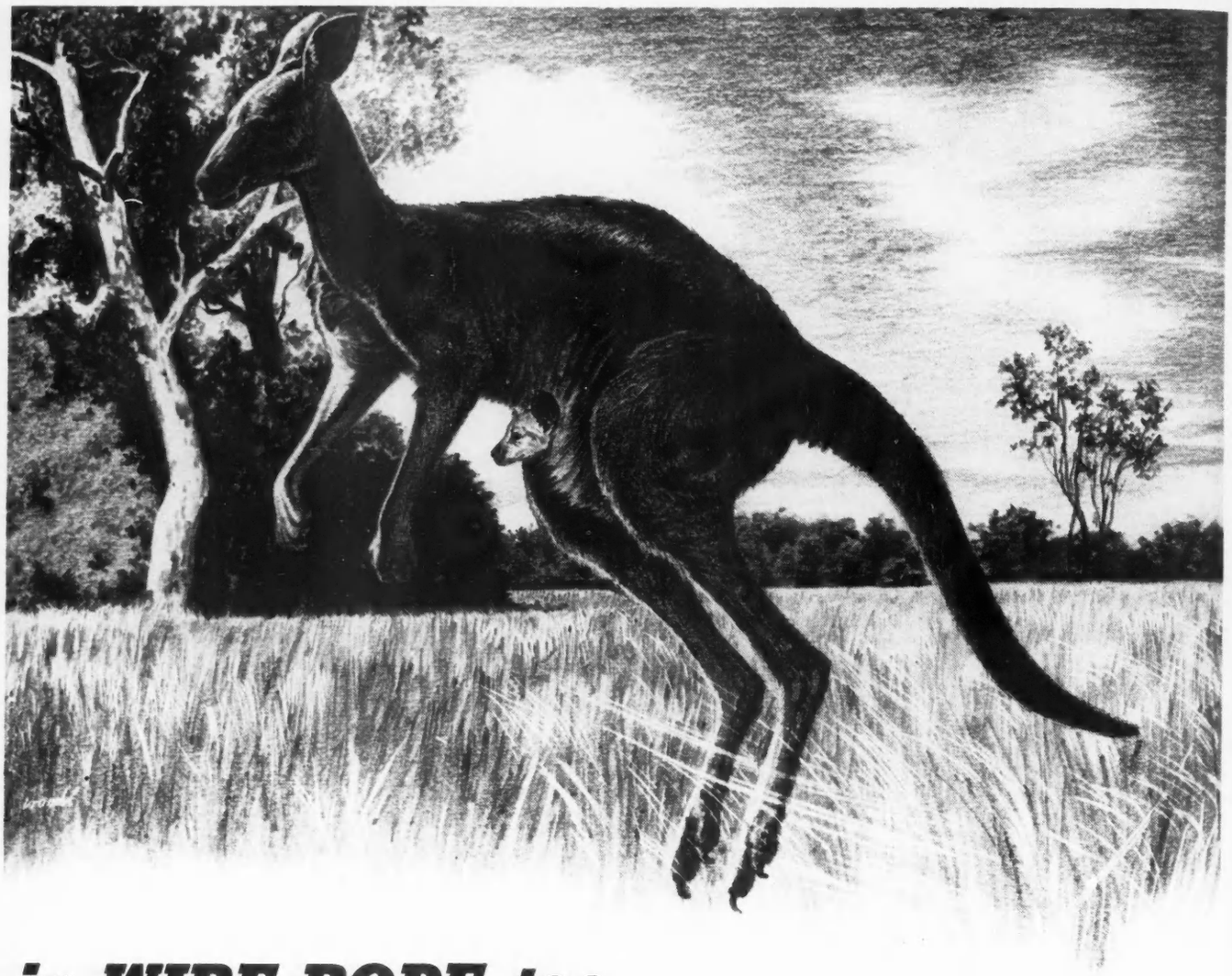
Since every oil well represents a different and often a unique problem, the Superintendent's job is multiplex. He must be expert in his selection of Tool Pushers, must work with them in selecting Drillers, cooperate with them in planning each well. He must know rigs and equipment, be ready with sound advice on any phase of the job, assist in handling such problems as wild wells, difficult fishing jobs, etc. He must be familiar with the many special organizations offering logging, directional drilling, fishing services, etc.; must understand all completion techniques. In a word, he must be a past master in every phase of well drilling.

Fine equipment is one of the basic factors which enable him to establish a reputation for fast, straight hole. For 25 years MISSION has been one of his valued allies in this department. He has found MISSION equipment unsurpassed in efficiency, dependability, and durability . . . has found that it reduces hazards, lowers equipment costs, helps him hold to the minimum time and cost per foot of hole.



MISSION MANUFACTURING CO.

Mission Mfg. Co., Houston, Tex. Export 30 Rockefeller Plaza, New York. Europe: London, England



in WIRE ROPE, too the RIGHT KIND of muscle makes the difference

Endowed with highly specialized leg muscles, the kangaroo is able to make tremendous flying leaps—even with Junior perched in the rumble seat.

In wire rope, too, specialized jobs call for specialized muscles. That's why in Wickwire Rope we make sure you always get the proper combination of physical properties to best resist the destructive forces found on your particular job—whether it be abrasion, load strain, shock stress or bending fatigue.

Wickwire Rope gives you the benefit of long experience and specialized know-how which assures you of exactly the right kind of rope your particular job demands.

For additional information write or phone our nearest sales office.

LOOK FOR THE YELLOW TRIANGLE ON THE REEL

THE COLORADO FUEL & IRON CORPORATION—Abilene (Tex.) • Denver • Houston • Odessa (Tex.) • Phoenix • Salt Lake City • Tulsa

THE CALIFORNIA WIRE CLOTH CORPORATION—Los Angeles • Oakland • Portland • San Francisco • Seattle • Spokane

WICKWIRE SPENCER STEEL DIVISION—Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) • New York • Philadelphia

WICKWIRE ROPE

CF&I

PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL & IRON CORPORATION

A plant...

designed and equipped in its entirety for the sole purpose of perfecting and building *one product.*

oilmaster

PUMPS

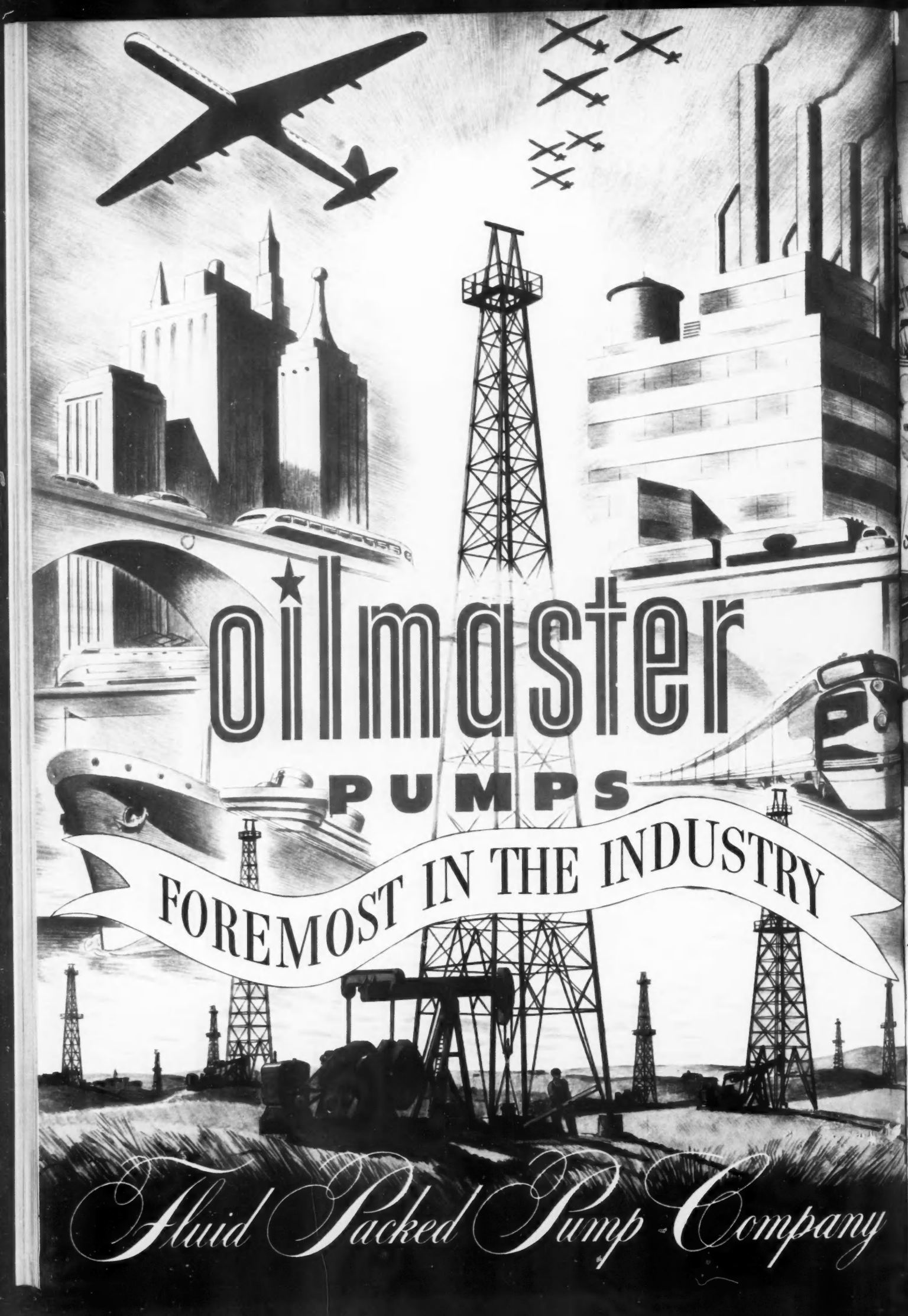
FOREMOST IN THE INDUSTRY

Main Office and Plant, Los Nietos, Calif.

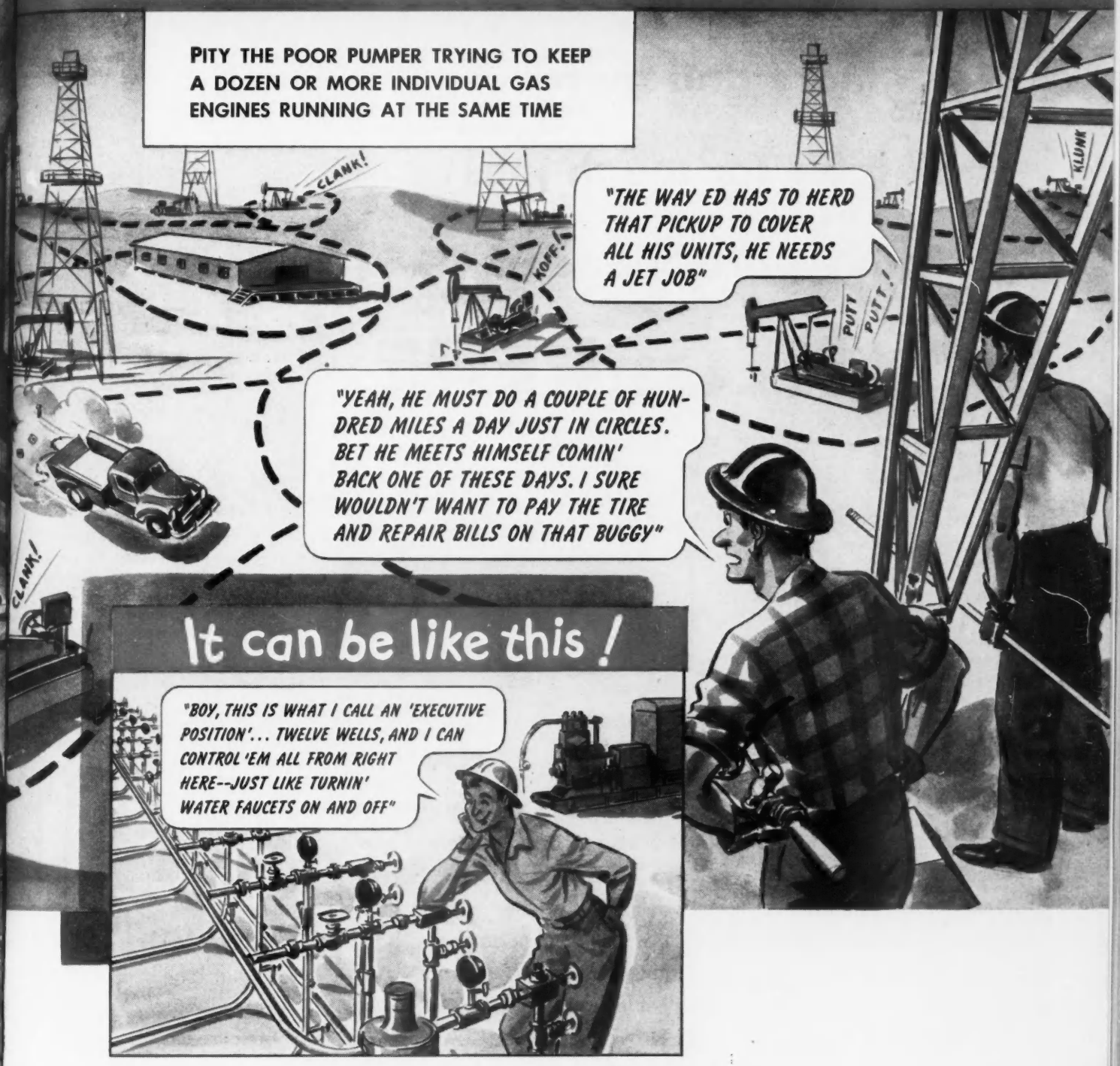
Distributed by The National Supply Co. Export: National Supply Export Corp., 600 Fifth Avenue, New York

Co-Distributors: Berry Supply Store, Beacon Supply Co., Industrial Supply Co.

Fluid Packed Pump Company


oilmaster
PUMPS
FOREMOST IN THE INDUSTRY
Fluid Packed Pump Company

It doesn't have to be this way...


PITY THE POOR PUMPER TRYING TO KEEP A DOZEN OR MORE INDIVIDUAL GAS ENGINES RUNNING AT THE SAME TIME
CLANK!
KOFF!
"THE WAY ED HAS TO HERD THAT PICKUP TO COVER ALL HIS UNITS, HE NEEDS A JET JOB"
PUFF PUFF!
KLUNK
"YEAH, HE MUST DO A COUPLE OF HUNDRED MILES A DAY JUST IN CIRCLES. BET HE MEETS HIMSELF COMIN' BACK ONE OF THESE DAYS. I SURE WOULDN'T WANT TO PAY THE TIRE AND REPAIR BILLS ON THAT BUGGY"
CLANK!

It can be like this !

"BOY, THIS IS WHAT I CALL AN 'EXECUTIVE POSITION'... TWELVE WELLS, AND I CAN CONTROL 'EM ALL FROM RIGHT HERE--JUST LIKE TURNIN' WATER FAUCETS ON AND OFF"

Free Pumping Makes the Difference!

Reduced maintenance—that's where Kobe Hydraulic Free Pumping obviously stands out over old pumping methods like a rare jewel in a fine setting. There simply is no comparison—whether you look at it through the eyes of management or those of the pumper. One man, without moving more than a few steps, can control many wells; and by himself can even change pumps.

But that's only part of The Kobe Story. Less obvious, yet far more important, are major provable savings of from 20% to 50% in lower installation and over-all operational costs due to the greater simplicity and efficiency of the Kobe Hydraulic Free Pumping System.

In other words, Kobe Free Pumping yields *more barrels per dollar*—at any depth, under all operating conditions.

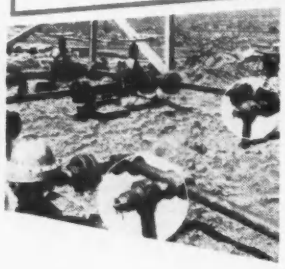
Your nearest Kobe representative has the facts and figures to prove these statements as they apply to your own locality. Consult him *today!*

Free Pump
KOBE
ONE OF THE DRESSER INDUSTRIES

KOBE INC. Division of Dresser Equipment Co. *General Offices:* Huntington Park, California. *Division* and *District Offices:* Avenal, Bakersfield, Long Beach, Los Angeles and Ventura, California; Cleveland, Ohio; Hobbs, New Mexico; Healdton, Oklahoma City, Tulsa, Oklahoma; Brownfield, Corpus Christi, Fort Worth, Houston, Kilgore, Midland, Odessa, Snyder, Texas; Casper, Wyoming; New York City

More and more oil tools for tough jobs have parts made of Du Pont NEOPRENE

S. F. D. Regulator made by Wilson Foundry and Machine Company, reduces well-head pressure, regulates back pressure and acts as well purger. Its main diaphragm, valve seat, and gaskets are made of neoprene.

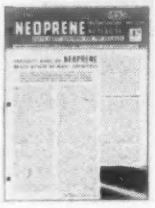


Shear Relief Valve manufactured by Cameron Iron Works is vital in protecting flow lines. It has a durable neoprene cushion ring to prevent fluid loss.

Designers and manufacturers of tools for the oil industry know the importance of the resilient parts on their products. Premature failure means delay in a costly exploring, drilling or production operation. And that's exactly why so many manufacturers specify neoprene for these vital parts. Neoprene can be compounded to possess the right combination of properties for many needs. It answers the physical requirements of resilience, abrasion resistance, high tensile strength, low compression set. But, what is more important, it *retains* its original properties to a remarkable degree . . . even when constantly exposed to oils, gases, many chemicals, high temperatures and pressures.

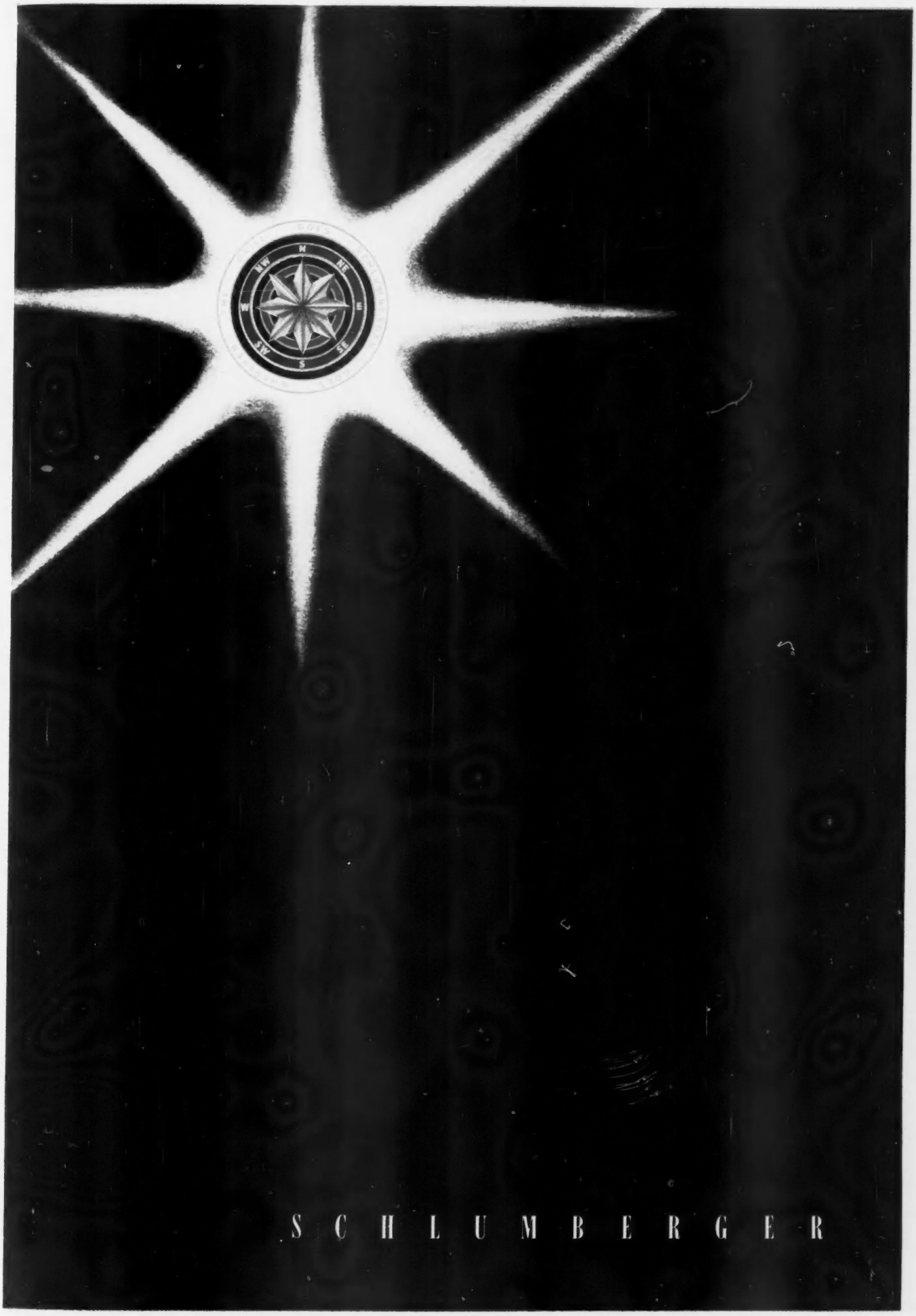
Since its introduction in 1931, neoprene has built a solid reputation of dependability in thousands of applications such as these shown here.

So when you need a resilient part for tough service conditions, ask your supplier about neoprene. He can formulate it to meet exacting requirements. And, neoprene will mean added efficiency, lower maintenance costs and longer service life for your product.



FREE! **THE NEOPRENE NOTEBOOK**

Interesting stories . . . new, unusual applications and products of neoprene. Write E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Division K-12, Wilmington 98, Delaware.

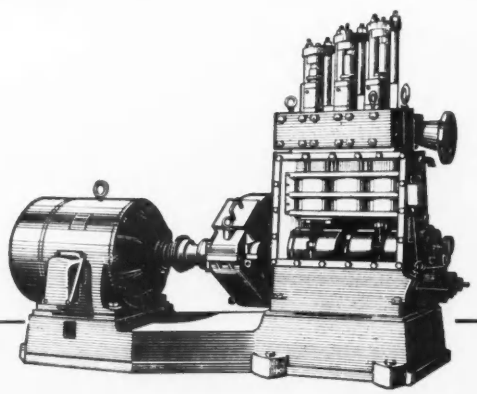

N
NE
E
SE
S
SW
W
NW
SCHLUMBERGER

more horse-power per pound

Famous for stamina and a sure foot, the burro was a hard-working "pardner" of the old-time prospector. He's a little fellow—but he packs more horse-power per pound than any of his four-footed cousins . . .

This ability to get more work done with fewer pounds to do it is precisely what Aldrich Direct Flow Pumps have to offer. As a result of improved design, weight of the fluid-end is considerably reduced. And—whereas a speed of 150 rpm was formerly considered high for reciprocating pumps—these compact, Direct Flow units are operating today at speeds of 500 rpm for the 3″; 360 rpm for the 5″; and 300 rpm for the 6″ stroke. In each case, you get greater volume and higher pressure from a smaller pump: *you get more horse-power per pound.*

Applications where you'll find Aldrich Direct Flow Pumps putting in time and over-time include: water flooding, salt water disposal, pumping lean oil to absorbers, and the handling of diethylene glycol, gasoline, propane, butane. Request Data Sheets 64, 64-B for complete information.



THE ALDRICH PUMP COMPANY

4 PINE STREET • ALLENTOWN, PENNSYLVANIA

...Originators of the Direct Flow Pump

Representatives: P. H. Arden, P.O. Box 185, Glenview, Ill. • Bushnell Controls & Equipment Co., 3929 W. Jefferson Blvd., Los Angeles 16, Calif. • L. T. Gibbs, 509 Petroleum Bldg., Tulsa 3, Okla. • R. B. Moore Supply Co., Inc., Bolivar, N. Y. • Power Specialty Co., 2000 Kipling St., Houston 6, Texas • Reeves & Skinner Machinery Co., 2211 Olive St., St. Louis 3, Mo. Stearns-Roger Manufacturing Co., 1720 California St., Denver 2, Colo. • **Export Sales:** Petroleum Machinery Corp., 30 Rockefeller Plaza, New York 20, N. Y. • Birmingham • Boston Buffalo • Cincinnati • Cleveland • Detroit • Duluth • Jacksonville • Omaha • Philadelphia • Pittsburgh • Portland, Ore. • Richmond, Va. • San Francisco • Seattle • Spokane, Wash. • Syracuse

Pipe Line Section

DONALD M. TAYLOR, SECTION EDITOR

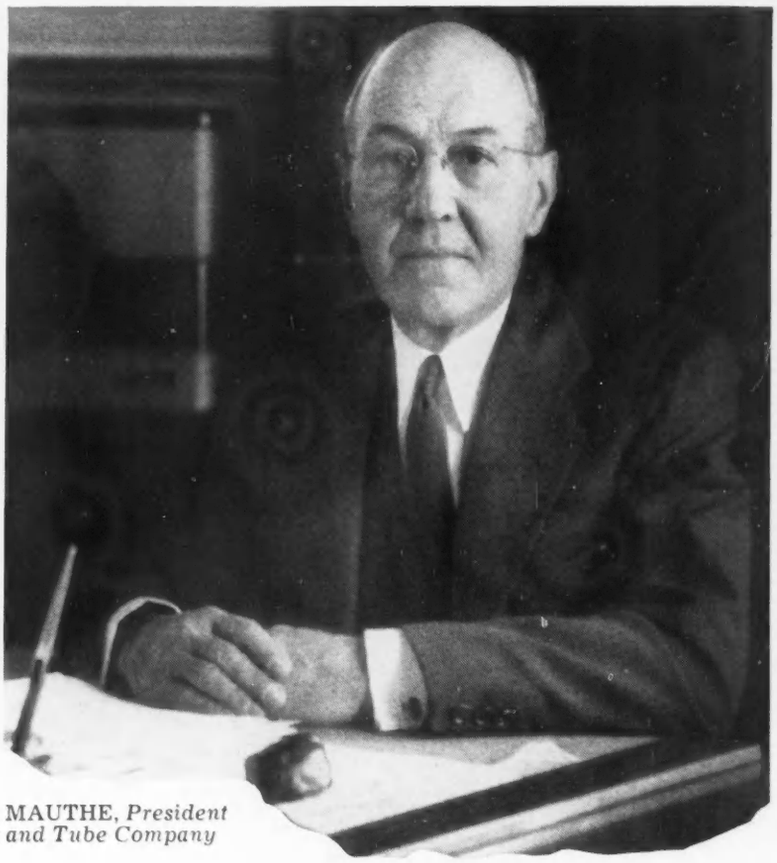
WORLD OIL

We hope he's on his way to your house..

GASO PUMP & BURNER MFG. CO.

902 EAST FIRST ST., TULSA, OKLA.

Why is the **scrap** situation so **critical?**



An interview with J. L. MAUTHE, *President*
The Youngstown Sheet and Tube Company

Why are you concerned about iron and steel scrap, Mr. Mauthe?

Our inventories are critically low and the present scrap flow is not sufficient to maintain capacity steel plant operations. Furthermore, if the flow of scrap is not increased, a curtailment of steel production is inevitable.

The industry is using all the pig iron and all the home scrap that is available. The balance of our metallic requirements must be made up through procurement of purchased scrap. Every ton of scrap that we do not get represents a ton of steel that we cannot make.

How much scrap does the industry need?

In 1950, 96,700,000 tons of steel ingots and castings were produced, requiring over 61,000,000 tons of iron and steel scrap.

In 1951, over 65,000,000 tons of scrap will be required, and even more will be needed in 1952.

Where does scrap come from?

About 58% of the total scrap required is produced by the ingot and casting makers, and is known as "home" scrap; the balance of 42% is "purchased" scrap and is procured from outside sources.

Purchased scrap generally falls into two categories: Scrap from current fabrication and that which is the result of obsolescence.

There are three important sources from which we get obsolete scrap, much of which is dormant:-

1 - Obsolete machinery and equipment in every industrial plant, at the oil fields and on the farms.

2 - Battlefield scrap, obsolete ships and war material, surplus machinery and equipment, which government can make available.

3 - Countless old automobiles and trucks, which are rusting away in automobile wrecking yards in every section of the country.

What can be done to increase tonnage of purchased scrap?

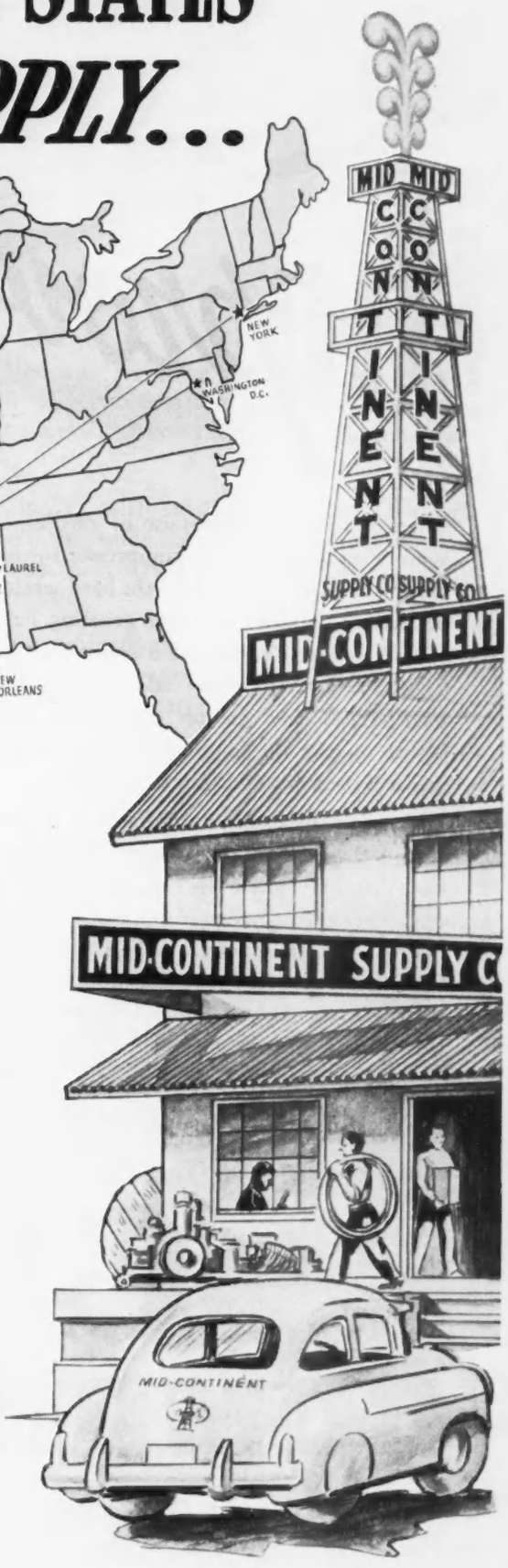
This scrap must be made available immediately! All industry and government must awaken to the critical nature of the situation. They must realize that if we do not get the scrap, they will not get the steel!

YOU CAN HELP - YOU MUST HELP!
NO SCRAP - NO STEEL

QUALITY V YOUNGSTOWN SERVICE

The Youngstown Sheet and Tube Company - Youngstown, Ohio

MID-CONTINENT STATES of *SURE SUPPLY...*



PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION MEMBER

...SURE QUALITY
...SURE SERVICE!

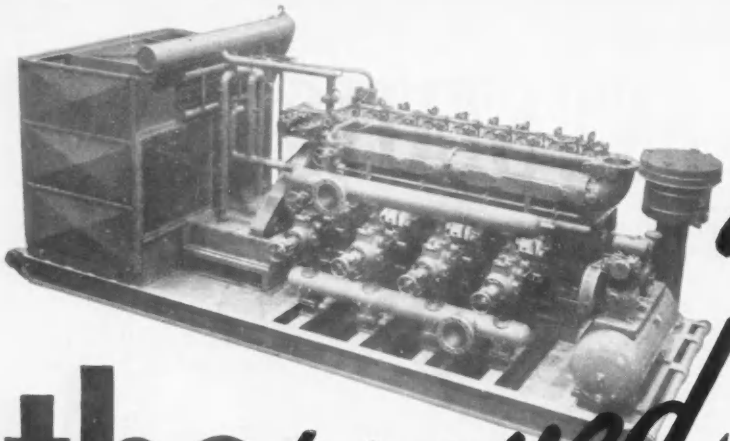
The greatest oil reservoirs in the country are located in the Mid-Continent States of Sure Supply — and strategically placed, fully stocked Mid-Continent stores are reservoirs of quality products and prompt, experienced service in this great oil producing area.

Topped by the famous oil-spouting, blue-neon derrick — the Mid-Continent store stands as a symbol of "Around-the-Clock" service wherever and whenever needed. Oil men know they will find personnel with facilities and "know how" to save them time and money when they stop under the blue neon derrick. Make Mid-Continent your SURE SUPPLY headquarters too!

MID-CONTINENT
Supply Company

General Offices, Mid-Continent Building **FORT WORTH, TEXAS**

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY



and now, even the proved Clark

There can be no compromise in selecting a semi-portable heavy duty compressor for oil field work. Either it can take the hard service or it can't. And six years of grueling field service have proved beyond a doubt that the Clark Midget Angle *can* take it. Today it incorporates even greater ruggedness than before to take the toughest kind of service and still come back for more.

Tremendous loads, a minimum of attention — the HMA of today has the stamina to keep driving where a less rugged unit would quit. That's what makes it so ideal for boosting field gas into pipelines, for gas lift operation and hundreds of other applications. *It is still the only compressor of its kind specifically engineered from the ground up for semi-portable service.*

Fully assembled and thoroughly tested at the Clark plant, the HMA comes to you as a completely self-contained, "packaged" compressor station ready to be operating in a matter of hours. And because it has perfect balance both horizontally and vertically, by reason of the *patented* Clark design, you can install it *anywhere* — on piling, swampland, barges, trailors, etc. — with little or no foundation.

With 8¼" bore and 8¼" stroke, the skid-mounted or stationary HMA is available to you in super 2-cycle, standard or high compression models of 2, 4, 6 or 8 cylinders, covering a range of 80 to 330 bhp.

Consult your nearest Clark representative at once, to obtain full details and literature.

there's a BIG difference in . . .

CLARK® COMPRESSORS

CLARK BROS. CO., INC. *One of the Dresser Industries* **OLEAN, N. Y.**

New York • Tulsa • Houston • Chicago • Boston • Washington • Los Angeles • Birmingham • Detroit • Salt Lake City • San Francisco • Buffalo • London • Paris • Varese, Italy • Ankara, Turkey • Buenos Aires • Caracas, Venezuela • Lima, Peru • Bogota, Colombia • New Delhi, India

Here's what WE mean by

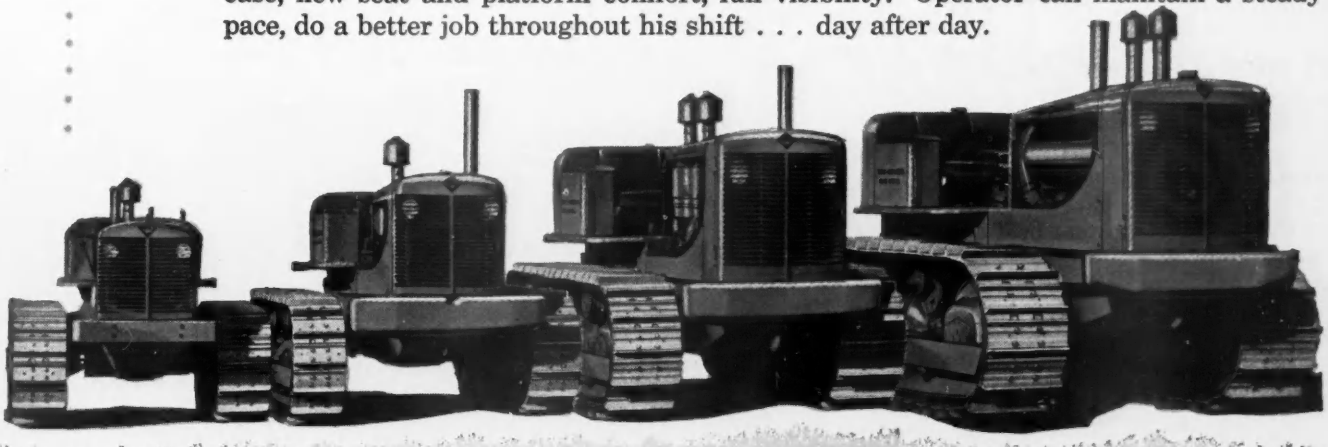
The Newest, Finest Tractor Line on Earth!

DESIGNED FOR YOUR JOB These Allis-Chalmers tractors are *new from the ground up* . . . without compromise anywhere in design or material. They are built to give you outstanding performance on any job, with any equipment—drawn or mounted. Fully matched line of Allied equipment!

BUILT TO "TAKE IT" These are the finest tractors ever built . . . with ample capacity and strength in every part! You can depend on them to take the loads and jolts of today's jobs . . . because they are modern tractors built for the most gruelling operating conditions. They will more than measure up to your expectations!

EASY TO SERVICE Adjustments are easier . . . lubrication simplified and lube periods greatly extended. Mechanics say these tractors are the easiest to service and repair. This all adds up to less down time, more producing time . . . longer tractor life at less upkeep cost.

EASY TO OPERATE Conveniently located controls respond to the slightest effort . . . and are operated in the same familiar way — nothing tricky to "catch on to." There is new shifting ease, new seat and platform comfort, full visibility. Operator can maintain a steady pace, do a better job throughout his shift . . . day after day.



HD-5
40.26 drawbar hp.
11,250 lb.

HD-9
72 drawbar hp.
18,800 lb.

HD-15
109 drawbar hp.
27,850 lb.

HD-20
Hydraulic Torque Converter Drive
175 net engine hp. 41,000 lb.

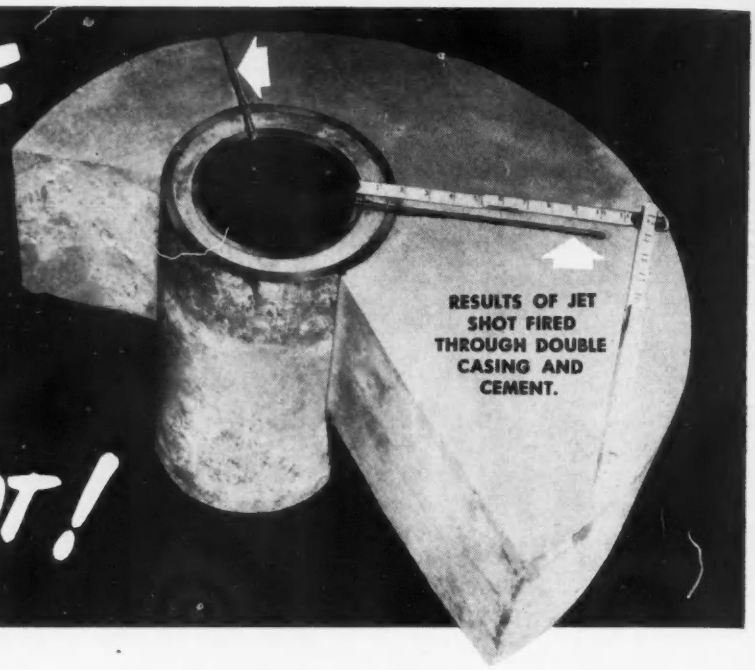
YEARS AHEAD

Each of these new Allis-Chalmers crawlers gives you a new yardstick for rating tractors. Each sets new standards in its class for performance, strength, servicing, operation. Get the full story from your Allis-Chalmers dealer NOW on this—The Newest, Finest Tractor Line On Earth.

ALLIS-CHALMERS
TRACTOR DIVISION — MILWAUKEE 1, U. S. A.

Play it SAFE

Call Perforating Guns Company For JET SHOT!

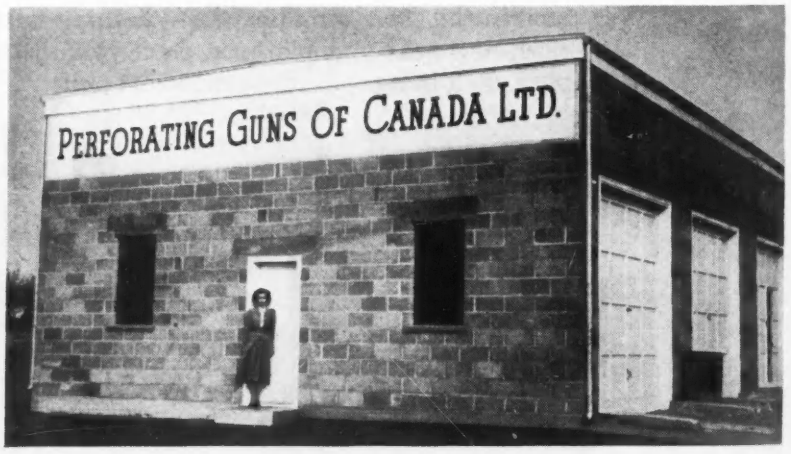


Canadian oil operators are "playing it safe" when they call in the Perforating Guns of Canada, Ltd. Our JET SHOT perforating service produces deeper penetration . . . greater permeability . . . increased oil flow . . . cleaner holes with less burr . . . better accuracy in placing shots . . . firing safety at any temperature . . . effective perforation in small casings . . . sure perforation of two and three casings.

JET SHOT is your *best* solution for better perforating — the *sure* solution for your tough jobs. Canadian oil operators have found that our competent field crews know how to get into and out of hole fast—with effective results.

Perforating Guns of Canada, Ltd., also provides services for Bullet Perforating, Open Hole Shooting, and wireline Baker Bridge Plugs.

We, like everyone in the industry, are convinced that our Canadian oil development is now only at the threshold of a tremendous future. Let's join forces for greater mutual success. Telephone or write us today for complete information on how we can assist you with *better* well completions.



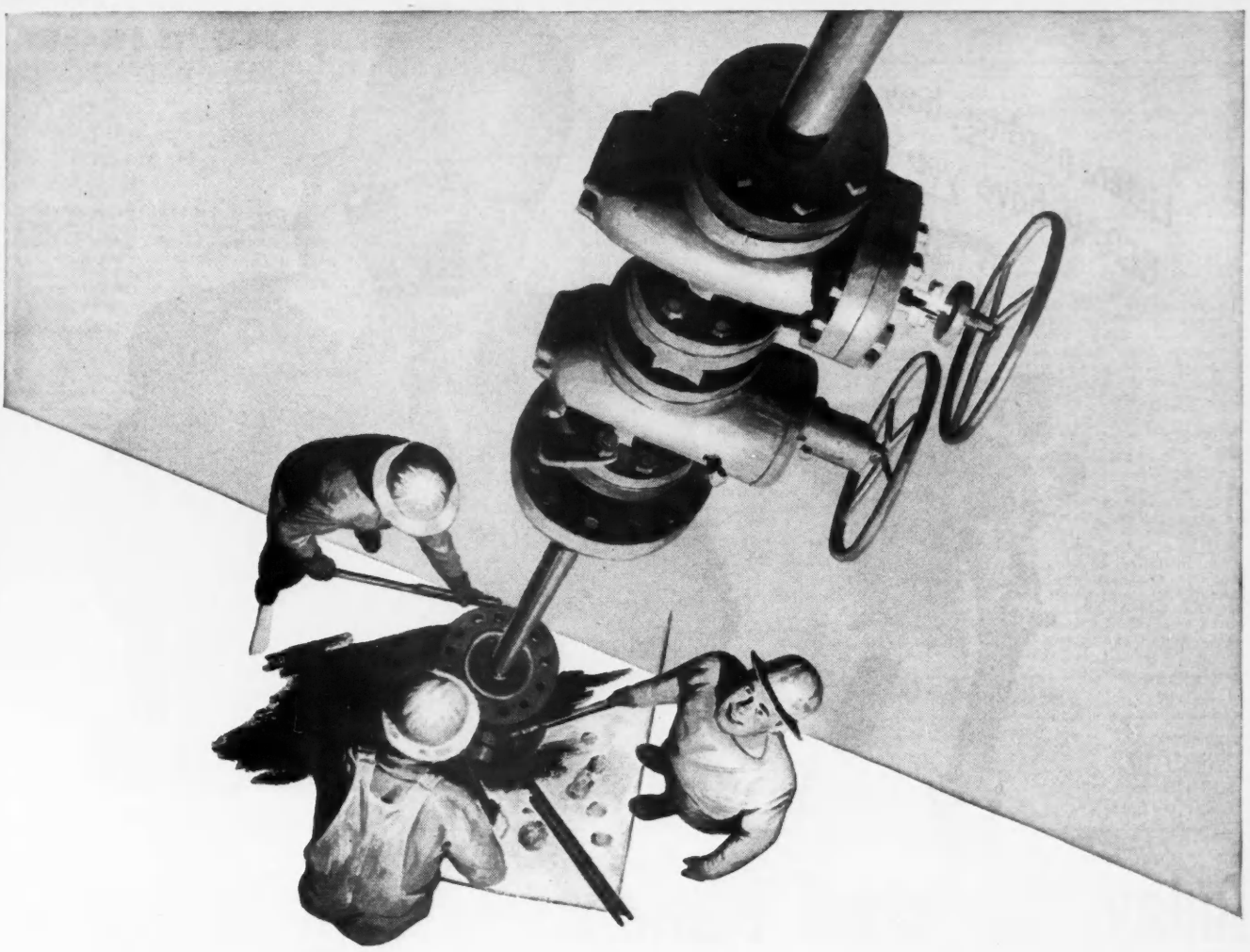
Partial view of new building housing offices and facilities of Perforating Guns of Canada, Ltd., at Edmonton. Services are rendered over a wide area with fast, completely equipped trucks manned by long-experienced crews.

PERFORATING GUNS OF CANADA, Ltd.

P. O. Box 5208, Edmonton, Alberta, Canada . . . Telephone: Edmonton 36325

Affiliate Company in United States:
PERFORATING GUNS ATLAS CORPORATION, Houston 3, Texas

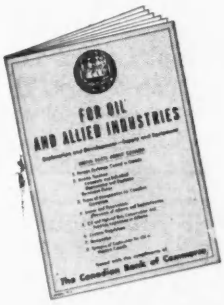
2123



"CONNECT" WITH CANADIAN OIL!

Consult the "banker-geologist" team of our Petroleum and Natural Gas Division at Calgary. These men know Canadian oil . . . follow trends and developments . . . interpret regulations . . . and can give valuable help in processing oil financing problems.

Moreover, with nearly 100 branches throughout the oil country of Western Canada, we are uniquely equipped to provide oil and gas interests with on-the-spot banking services. For an advantageous banking connection, make us YOUR Canadian bank.



Newly Revised!

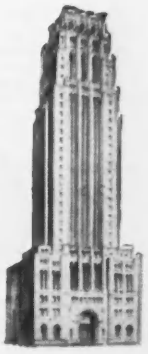
"For Oil and Allied Industries" brings you up to date on such matters as Canadian exchange control; taxes; leases and reservations; customs regulations; a map of the oil and gas fields; and a wealth of other information. Write for your copy to: Petroleum and Natural Gas Division, The Canadian Bank of Commerce, Calgary, Alberta, Canada.

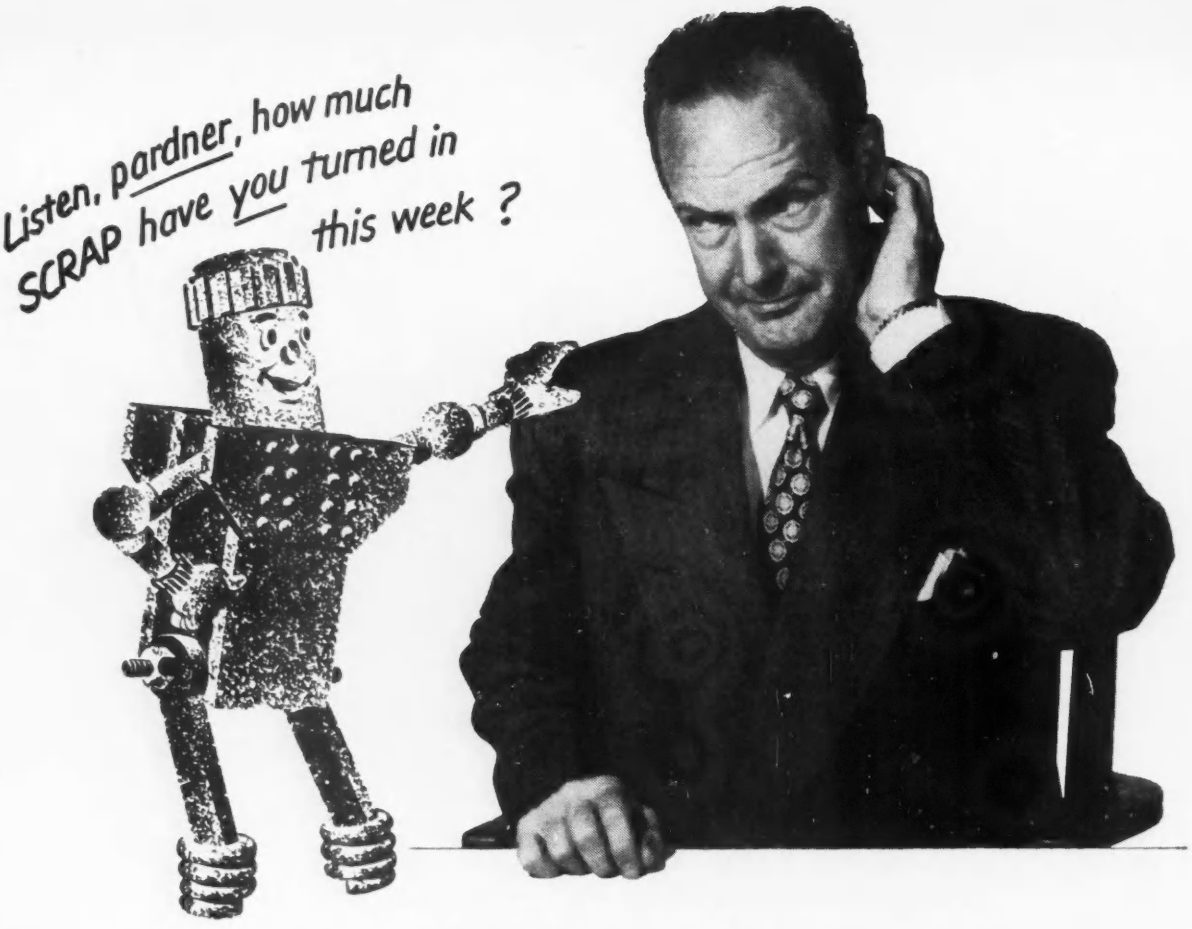
The Canadian Bank of Commerce

HEAD OFFICE: TORONTO

New York San Francisco Los Angeles Seattle Portland, Ore.

600 Branches across Canada





Today, the steel business is your business

—*it needs all your SCRAP, Now!*

SUPPOSE that every steel user were suddenly told that he had to turn in a half-ton of scrap before he could get a ton of steel. It would start the most gosh-almighty treasure hunt for scrap that ever happened.

In effect, this "no-scrap, no-steel" situation virtually exists. For without *all* the scrap that industry can search out and start on its way to the mills, steel production will surely drop. It's as serious as that.

More scrap is urgently needed. Today the mills are turning out more steel than ever before. But they're scraping the bottom of the barrel as far as scrap is concerned. Defense and domestic demands for steel simply cannot be met unless at least 100,000 tons of "purchased" scrap roll into the furnaces—*every day*.

The bulk of this scrap must come from industry. That's why we're asking for your all-out help. That's why it's so important that you make the drive for scrap part of your daily operations. Make it your business to encourage every employee to report any obsolete, broken or worn-out machinery, tool or equipment that has seen its day. From this dormant "junk" must come the heavy melting scrap that the mills need most. Don't let your scrap lie idle; send it on its way. How about it, pardner?

You'll find your local scrap dealers listed in the yellow pages of the phone directory.

This page would ordinarily be used to tell you about

NATIONAL SEAMLESS
Drill Pipe, Casing and Tubing

but, because without SCRAP we cannot produce steel, we are asking instead for your all-out help in getting more SCRAP to the mills.

NATIONAL TUBE COMPANY, PITTSBURGH, PA.
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS TRADE MARK

1-1326

UNITED STATES STEEL

WORLD OIL'S Trading Post

CLASSIFIED ADS

SERVICES · PERSONNEL · USED EQUIPMENT

RATES: Regular Classified (undisplayed) set in this size type: 10 cents per word. If Box Number is to be used count an additional six words. Replies forwarded without charge. Situation Wanted: 5 cents per word. Display advertisements, set in suitably larger type with ruled border: $9.00 per column inch per insertion. Situation Wanted: $4.50 per column inch. **All classified ads payable in advance.** 10% Discount if 3 or more insertions are ordered at one time. **COPY DEADLINE:** 5th of month preceding date of issue. Send copy and checks to: Trading Post Section, World Oil, P. O. Box 2608, Houston, Texas.

FOR SALE

■ Well drills, spudders, rotaries, core-drills. All sizes new and used equipment. Tools, drill pipe, cable, pipe. Fishing tools rented. Everything for well drilling. Pressey & Son, Pueblo, Colorado.

■ FOR SALE: Used oil barges, excellent for conversion to drilling and material barges. Write Commercial Petroleum & Transport Co., 344 Esperson Building, Houston 2, Texas.

■ 44 OIL FIELD Cyclone Churn Drill. Has only drilled 4000 ft. since purchased new. Mounted on 3 Ton International Truck; Truck in perfect shape. Good Tires all around. 700 ft. ¾ inch Cable. 400 ft. 7/16 inch Sand Line. Blower and Reverse gear attachment. Price, $5700. Kabele Bros., Platteville, Wisconsin.

FOR SALE

NATIONAL 50 TYPE ROTARY RIG

Equipped with National Drawworks, Table, Pump and Blocks. Byron Jackson Hook, Two Diesel Motors rated 153 BHP Each. Lee C. Moore Portable Mast and Base. Two Steel Dog Houses and Light Plants. New or used 4½" Drill Pipe and Joints. Rig is mechanically good and complete in every detail. Priced right for good investment. No Commissions paid. Inspection Invited. Inventory List available. Address replies to Box 31-W, c/o WORLD OIL, Houston, Texas.

FOR SALE

6", 8" and 10" cast iron water pipe fittings
Miscellaneous standard fittings 2" thru 4"
1" fittings
3,000 - 1" x 8" nipples
4,000' of 2½" line pipe
2,500' of 1" black pipe
Miscellaneous pipe 2" thru 4"
2 - 4 x 4 Chevrolet Trucks
1 - Auto Car Army Fuel Truck
1 - Chicago Pneumatic No. 60 Air Compressor
1 - 30' Spartan Trailer House

This material and equipment can be seen at the Gulf Coast Oil Field Service yard on the Houston Hiway just out of the City limits of Victoria. Call 2988 or 5339 in Victoria for further information.

LIQUIDATING ESTATE
At Attractive Price

Developed Oil Properties in Bradford Field, McKean County, Pa.
122 Wells Drilled in 1947 equipped with new material—Depth 1850 feet
68 electric jack—automatic controls
3 powers
1 water pressure plant

These properties can be water flooded with good future oil possibilities.

Write:
John De Petro, Petroleum Engineer
Terminal Building Bradford, Pa.

FOR SALE

■ OWNERS want to sell part royalty 2560 acres, Texas; 240 acres Lea Co. N. M. lease; 480 acres California lease. C. W. Deming, Waycross, Ga.

■ TWO 150 horsepower F and T boilers located at Eunice, New Mexico. Makin Drilling Co., Box 131, Hobbs, New Mexico.

■ ADDING MACHINES, typewriters, new portables, office size typewriters wholesale. Enclose 10c for catalogues. Apply, 993A Westchester Ave., New York City 59.

NEW SURPLUS
PRESSURE GAUGES AND THERMOMETERS

Write for catalog describing thousands of surplus Pressure Gauges and Thermometers at a fraction of original cost. Available for immediate delivery.

MIKE A. TRAVIS
Phone 5-6608 221 W. Second Tulsa, Okla.

Complete Drilling Rig

for sale with jack knife derrick, E C 86 Cardwell Draw Works, 5000 feet drill pipe. New Transmission, jack shaft and 2 new 145 WAK Waukesha Motors. Call 704 Cisco, Texas.

HELP WANTED

■ PETROLEUM ENGINEER or technologist for secondary recovery research laboratory in eastern United States. Advanced degree or production research experience preferred. Liberal publication policy. Opportunity to gain first hand experience in secondary recovery through coordinated laboratory and field research. Salary open. Reply giving educational background and experience. Box 30-W, c/o WORLD OIL, Houston, Texas.

■ RESEARCH Group Leader and Research Engineer—26-40—B.S., and preferably a Ph.D. in physical chemistry, physics, petroleum engineering, or chemical engineering. Should have experience in reservoir engineering, reservoir mechanics, research, or fluid flow research. Will be responsible for research program in multi-phase flow and other aspects of reservoir mechanics. Salary open. Location—Ponca City, Oklahoma. State age, experience, education, and salary desired in opening letter. Write direct to Personnel Records Division, Continental Oil Company, Ponca City, Oklahoma.

■ RESEARCH Engineer—26-40—B.S., and preferably an advanced degree in petroleum or mechanical engineering. Must be widely experienced in well completion practices. Will be responsible for research program in well completion practices and well mechanics. Salary open. Location—Ponca City, Oklahoma. State age, experience, education, and salary desired in opening letter. Write direct to Personnel Records Division, Continental Oil Company, Ponca City, Oklahoma.

HELP WANTED

WANTED—SALES ENGINEER

A large national and well established manufacturing organization of oil industry and industrial equipment has an opening for a sales representative to cover East Texas and South Louisiana. Age 30 to 40. Job will require approximately 75% of time traveling in the territory and within a year will require establishing residence in Louisiana. Oil field experience not necessary but helpful. Must have sales experience.

Replies confidential. Our organization knows of this ad. In replying give full details, experience, present salary and any other pertinent information. Will contact for personal interview if you look like our man. Address Box 32-W, c/o WORLD OIL, P. O. Box 2608, Houston, Texas.

■ RESEARCH Metallurgist—26-40—B.S., and preferably advanced degree in metallurgy or metallurgical engineering. Should have experience with all types of laboratory apparatus for metallurgical study and experience in selecting materials for all types of services. Corrosion studies, materials selection, and analysis of failures will constitute the bulk of the work. Salary open. Location—Ponca City, Oklahoma. State age, experience, education, and salary desired in opening letter. Write direct to Personnel Records Division, Continental Oil Company, Ponca City, Oklahoma.

DECALS

TRUCK LETTERING AND TRADEMARK decals made for your trucks. Easy to apply, uniform, distinctive, economical for small or large needs. Write for Catalog. Mathews Company, 827 S. Harvey, Oak Park, Ill.

WANT TO BUY

■ WANTED—Suitable unitized portable drilling rig; 3,000 to 3,500 foot capacity; complete with 3,500 feet of 3½" EUE drill pipe; min. 7½ x 12 pump; mast, etc. Send full details and quote price F.O.B. loaded cars, to American Northland Oil Company, 127 Montgomery St., San Francisco, California.

BUSINESS OPPORTUNITIES

■ WE WILL BUY Producing Oil Royalties. Send Particulars. Standard Security Co., 111 Broadway, New York 6, New York.

WANTED TO DRILL IMMEDIATELY

A Lease That Is Off-set to Production.
Submit full details to Nelson B. Cramer, 2831 E. Ocean Boulevard, Long Beach 3, California

SITUATION WANTED

Drilling contractor operating in West Texas and New Mexico desires to contact small or medium-sized independent oil company who needs an operating manager. Personal interview desired. Twenty years experience in all phases of the oil industry. Address replies to Box 94-W, WORLD OIL, Houston 1, Texas.

PERSONAL

— ATTENTION —

HAYES O. TREGO—or any one knowing his whereabouts—Please contact me at once as mother is seriously ill.

PAUL WINTERBAUER
417 Wayne St. Dallas, Texas

BARRET

SPECIALIZING IN MAGNETIC SURVEYS

Contracts accepted for domestic and foreign projects, using the most improved instrumental and interpretative technique.

William M. Barret, Inc.

Consulting Geophysicists

GIDDENS-LANE BUILDING
SHREVEPORT, LOUISIANA

A FISHING JOB THE OIL MAN WILL GO FOR

A Perfect Christmas Gift

Four Beautiful Di-Dipper Lures with Feathered Streamers, neatly packed in a sectional, hinged-top plastic box.

These baits are designed to catch fish—not fishermen.

$5.00 per set

Three sets for only $14.00. Additional discounts on larger quantities.

No C.O.D.'s, please. Shipped to you—or for you.

A & G DISTRIBUTORS

807 Daniel Bldg. Tulsa, Oklahoma

Order Now for Christmas

Money Clip
Hand Engraved

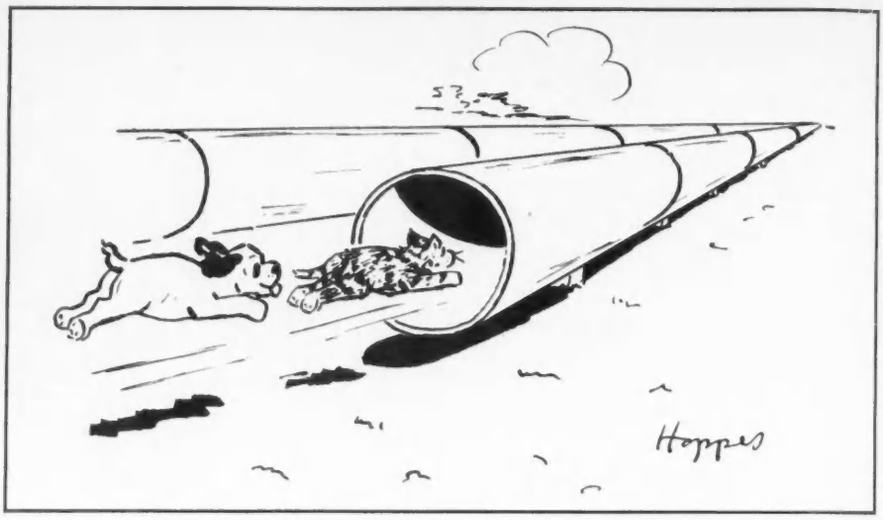
Sterling Silver Clip with Gold Derrick price

$8.00
(tax incld)

Here's the gift you've been looking for . . . hand engraved sterling silver money clip, with 10 carat gold raised surface derrick . . . signet on the back for your initials . . . the practical gift for your "oil country" friends. Send check or money order to—No C.O.D.:

Nelson Co., Inc.

2016 Travis Houston, Texas



Too Close to Home

A Hollywood director reportedly changed his mind about a trip around the world with this remark: "I think I'll go somewhere else instead."

To The Trenches, Men!

A self-styled reformer was watching a pipe line trench being dug with modern machine methods. He said to the spread superintendent:

"This machine has taken jobs from scores of men. Why don't you junk it and put 100 men in that ditch with shovels?"

The superintendent snorted: "Better still, why not put a thousand men in there with teaspoons?"

Slogans for Our Times

Alimony: "High Cost of Leaving."
Selective Service: "Weed the People."
Dollar Sign: "Capital S That's Been Double Crossed."
Republicans: "Anti-HST-men."

Personnel Problems

Definition of a Boss: The man who's always late when you're early, and vice versa.

Transfer

It doesn't take very long before a ring on the table develops into a circle under the eye.

Gotkool
water cans and coolers
GOTKOOL WATER CAN
Made in 1½, 2, 3, 5, 10, 15 and 20 gallon sizes. Push-Button Faucet at slight additional cost.
KEEP PURE DRINKING WATER ALWAYS HANDY
GOTKOOL WATER COOLER
Made in 2, 3, 5, 8, 10, 15 and 20 gallon sizes with Push-Button Faucet.
GOTT Water Coolers are the convenient way to keep drinking water handy to the worker, protect it from impurities. Their exclusive construction keeps water cool for long periods. Snug-fitting, large, removable top, handy non-leaking push-button faucet. GOTT Water Cans for handy field use. Your supply store has them, get one today!
STANDARD OF THE OIL FIELDS
Insist on the Genuine
GOTT
WATER COOLER
PURE WATER
H. P. GOTT MFG. CO.
WINFIELD, KANSAS

What's NEW

In Perforating, Testing, and Fishing Tool Services

McCULLOUGH®
NEW SERVICES • NEW TOOLS
NEW WAYS OF DOING THINGS

Latest News About New Tools, Techniques and Services

SAVE TIME, MONEY and PIPE

With McCullough Jet Back-Off Tool or String Shot Service and the One and Only Magna-Tector!

Pipe is scarce and rig time is costly. What could be more economical than backing-off the pipe, recovering all free pipe above the stuck point in one piece, and getting it done in a fraction of the time?

Yet there are limitations in the use of only ONE back-off tool in attempting to free stuck drill pipe, drill collars, subs, casing, tubing and wash pipe. NO ONE TOOL can accomplish EVERY back-off job. But there are TWO back-off tools and between the two, EVERY TYPE of back-off job CAN be accomplished!

That is why McCullough crews arrive at your well with both the McCullough Jet Back-Off Tool and String Shot. These tools plus the McCullough Magna-Tector, that quickly and accurately locates the stuck point, represent an extremely versatile combination service designed to save you time, money and pipe.

These are NOT mechanical tools or fishing tools. They are progressive tools, electronically controlled for accuracy and speed. They are responsible for the sharp decline in fishing in recent years, permitting wells to be drilled faster—saving oil operators thousands of dollars!

HOW YOU SAVE TIME, MONEY AND PIPE

1. TIME SAVER
   a. Accuracy of the McCullough Magna-Tector in locating the stuck point consistently, eliminates unnecessary back-off shots.
   b. New, high-temperature, high-pressure resistant detonators in the back-off tools eliminate mis-runs.
   c. These electric wire line tools are run into and out of the well in a fraction of the time required with mechanical cutters.
   d. In addition they are electronically controlled permitting greater speed and accuracy than ordinary electric wire line tools.
   e. Electronics also provides MORE information about conditions in the well—locating collars, tight places, fluid level, etc., both audibly and visibly.
2. MONEY SAVER
   a. McCullough Back-Off Service accomplishes ANY TYPE of back-off job, leaving the fish in good condition for subsequent operations.
   b. The use and need of a rotary table is eliminated.
   c. McCullough Magna-Tector, many times, indicates that working and spotting oil will free the pipe, eliminating the need of backing-off and fishing.
   d. Guesswork is eliminated.
3. PIPE SAVER
   a. Eliminates cutting and damage to the pipe.
   b. Permits recovery of all free pipe in one piece and the freeing and recovery of all stuck pipe in undamaged sections.

WHAT TO DO

When your pipe becomes stuck—CALL McCullough IMMEDIATELY! The McCullough Magna-Tector will quickly locate the lowest free point, the stuck point and do it accurately. Then the McCullough Back-Off Service will free all loose pipe in one piece—simplifying the fishing job.

Since time is important McCullough Back-Off Service is fast. All free pipe will be removed BEFORE it can stick further up the hole.

No two stuck pipe conditions are exactly alike. This is another reason why you NEED McCullough VERSATILE Back-Off Service. The complete equipment, the skill of experienced McCullough crews, and the special techniques they have devised WILL SAVE YOU TIME, MONEY AND PIPE!

Call McCULLOUGH!!

WRITE FOR THIS CATALOG

Pages 3228 to 3231 in the McCullough section of the Composite Catalog describes these tools individually and in detail—with illustrations, specifications and operating data. Write for your free copy today.

PERFORATING, TESTING AND FISHING SERVICE ANYWHERE — ANYTIME!

McCULLOUGH TOOL COMPANY
5820 South Alameda Street, Los Angeles 58, California
405 McCarty Street (P.O. Box 2575) • Houston, Texas
CANADA: Edmonton, Alberta • **EXPORT OFFICE:** Los Angeles, California
VENEZUELA: United Oilwell Service Co., S.A.; Caracas, Anaco, Maracaibo

SERVICE LOCATIONS: **TEXAS:** Houston, Snyder, Alice, Cisco, Corpus Christi, McAllen, Odessa, Tyler, San Angelo, Victoria, Wichita Falls. **OKLAHOMA:** Oklahoma City, Guymon, Healdton. **MISSISSIPPI:** Laurel. **NEW MEXICO:** Hobbs. **KANSAS:** Great Bend. **WYOMING:** Casper: **CALIFORNIA:** Los Angeles, Avenal, Bakersfield, Ventura. **LOUISIANA:** Houma, Lake Charles, New Iberia, Shreveport. **COLORADO:** Sterling.

Mid-Continent NEWS and HUMOR?

BREAKFAST AT THE SHAMROCK FOR IPAA

Mid-Continent Supply Co., the oil industry's most hospitable organization, was host to some 1000 IPAA members and their wives at a breakfast in the beautiful Shamrock Room of Houston's Shamrock Hotel on Monday and Tuesday mornings, October 22 and 23 during the Annual IPAA Meeting.

MID-CONTINENT HOSTS...

. . . and IPAA's Chairman of the General Arrangements Committee. Left to right, above, are J. A. Daugherty, Mid-Continent's Vice President in charge of the Gulf Coast Division; Ken W. Davis, President of Mid-Continent; R. E. Smith, IPAA General Arrangements Chairman. and D. H. Thornbury, Executive Vice President of Mid-Continent.

OVER THE COFFEE CUP...

. . . oil talk by (left to right) Mid-Continent President Ken W. Davis; General Ernest O. Thompson, Railroad Commission of Texas, and R. F. Windfohr, President of the Texas Mid-Continent Oil & Gas Association.

MID-CONTINENT Supply Company

General Offices Mid-Continent Bldg. FORT WORTH, TEXAS

SQUEAKS FROM THE BULLWHEEL

Ever a Huckster

"To each man who has worked for me for 20 years I give and bequeath $5000," said the dying merchant.

"But," said his lawyer, "you haven't been in business 20 years."

"I know it, but it's good advertising."

Emergency Case

Doctor: "I want to make a change in the death certificate of Mr. McWhorterfield."

City Clerk: "Anything wrong?"

Doctor: "I signed my name in the space marked cause of death."

He'll Eat His Words

He was spending a lot of time on her. He was also showering her with sweet and eloquent words. "You look good enough to eat," he told her with fondness.

"I do eat," she retorted. "Let's go."

Tip-Off

"Oh, darling, I love you so. I'm not wealthy, like Jerome Green. I haven't a car, or a fine house, like Jerome Green. But darling I love you."

"And I love you, too, darling; but where is this man Green?"

Sure Lure

Fish story of the year for the Abilene, Texas, office of Sun Oil Company occurred when J. B. Halstead, Henry Lee, Dick Colvin, and brother, Don Colvin, went on a hunting trip to Stonewall County, Texas. They winged several doves, which fell into a nearby tank. There before their disbelieving eyes the Abilene Sun men saw a large bass surface and devour the doves before they could be retrieved.

Determined not to be bested by a fish, they returned the following day with fishing equipment—but to no avail.

Their conclusion: Doves are the only bait to use for bass fishing.

Evidence

Hunter (boring company with his tales): "And while wandering around the native village, I spotted a leopard."

Listener: "Now I know he's a liar. They come that way."

You'll Get a Bang Out of This

"Was he surprised when you said you wanted to marry his daughter?"

"Was he! The gun nearly fell out of his hand."

Life Saver

Pat hesitated a long time before even speaking to Mike, but curiosity got the better of him, and he had to ask:

"Mike, I hope it isn't true what I heard the other day, that ye'd become a Communist. Sure, and why did ye go and do a thing like that?"

Unruffled, Mike replied, "Of course I joined the Communist Party. My doctor told me I had only ten days to live, and wouldn't you rather see a Communist die than a good Irishman?"

A Few Home Truths

People who live in glass houses will do well to answer their doorbells.

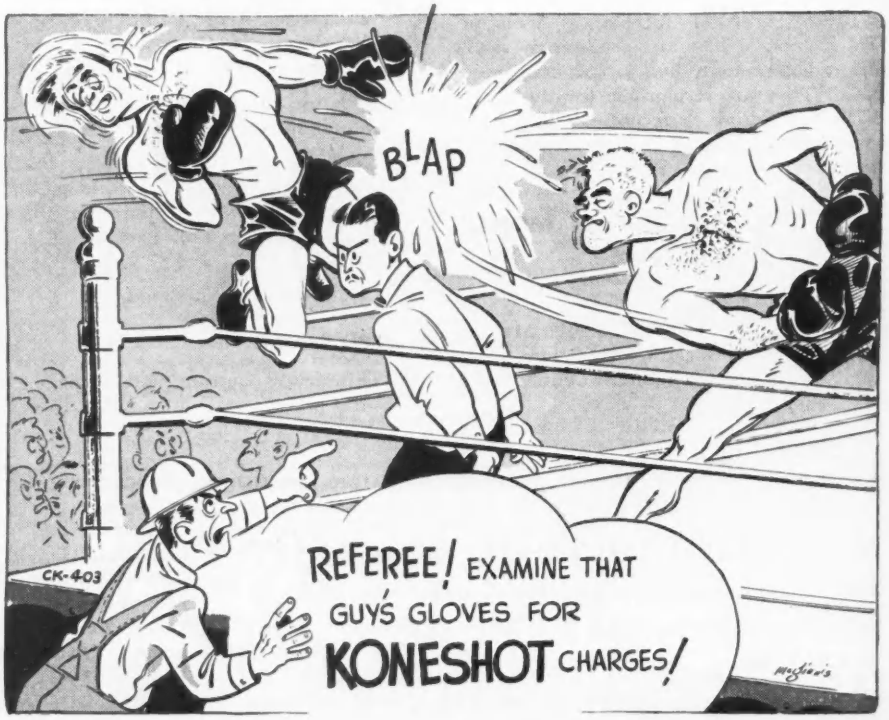
A girl will scream when she sees a mouse, but she will get into the car with a wolf without saying a word.

The depression that has caught many a man is the cute little dimple.

A low neckline is something you can approve and look down on at the same time.

Craftsmanship

There's nothing wrong with being a self-made man if you don't consider the job finished too soon.



close at hand...

Yes, as close as your telephone or the Hinderliter sales engineers in your area.

Chances are that the type of Hinderliter Tree generally used in your field has already been designed. While your particular wells or your practices may require variations, Hinderliter Trees can be delivered when you need them.

Hinderliter Trees are fabricated to your individual specifications and every component has been field tested for performance. You can reduce completion time and cost, and be assured of safety for well and equipment with Hinderliter *"Better Built"* Trees.

HINDERLITER
PORTER
"Better Built"
EQUIPMENT

Sold only through SUPPLY STORES

HINDERLITER TOOL COMPANY DIVISION

H. K. PORTER COMPANY, INC.

TULSA 1, OKLAHOMA **DRAWER 2650**

CONTACT YOUR FAVORITE SUPPLY HOUSE

STANDARDIZE ON

PARMACO PRODUCTS

THEY SATISFY

PARKERSBURG MACHINE CO. PARMACO PARKERSBURG, W. VA. U.S.A.

The House of Courteous Service

WANTED
NEW OR USED
DRILL PIPE
3½" AND 4½" FULL HOLE
Range 2, Grade D & C.
If used must be Tubescoped
Hector Machine Co. Ltd.
9th Ave. and 19th Street East
CALGARY, ALBERTA. Phone 55228

Standco
NO-SMOKE
STANDCO BRAKE LINING
Nothing novel—no bunk, but it gets the job done without scoring brake rims. See pages 3973-3978 Composite Catalog.
Standco Brake Lining Co.
HOUSTON

HOUSTON LABORATORIES
Analytical and Consulting Chemists
Hydrocarbon Gas Analyses, Reservoir Equilibria Studies for Crude and Condensate Well, Waters, Brines, Corrosion and Industrial Analyses.
Phone CApitol 1319, Box 132, Houston, Texas

PRINTED FORMS FROM STOCK
Immediate delivery of producing and pipe line forms made from our complete line . . . Write for completely illustrated catalog.
GULF PUBLISHING CO.
P. O. Box 2608 Houston 1, Texas

SQUEAKS FROM THE BULLWHEEL

Sales Technique

A man finally bought a parrot at an auction after some spirited bidding. "I suppose the bird talks," he said to the auctioneer.

"Talk?" was the reply. "He's been bidding against you for the past half hour."

Nuptial Nip-Ups

A young man barged into a minister's home, a lovely young lady in tow, and exclaimed, "We want to get married. I beg you to make the ceremony as short as possible. Here are the credentials. They're in order. Those two ladies knitting over there will do as witnesses."

The minister, amused, performed the ritual, pocketed his fee, and then protested, "Remember the old adage about marrying in haste, my children. What's your hurry?"

The young man, already half way to the door, said over his shoulder, "We're double parked!"

Give and Take

Sign on Chaplain's door: If you have troubles, come in and tell us about them. If you don't have any, come in and tell us how you do it.

Sworn to Tact

"You seem to have plenty of intelligence for a man in your position," sneered a lawyer, cross examining a witness.

"If I wasn't under oath I'd return the compliment," replied the witness.

"Who left the barn door open?"

Greaseless Axles

A Negro parson was preaching on Hell: "Bredren," he thundered, "de Lord made de world round like a ball, and de Lord made two axles for it to go around on—one at de North Pole and de other at de South Pole. And de lord put a lot of oil in the middle of the world to keep the axles well greased. And den a lot of sinners dig wells in America and in many other places and steal the Lord's axle grease.

"And some day dere won't be no more oil and dem axles is gonna git powerful hot. And da will be Hell, dear bredren, dat will be Hell."

HOW LONG IS A TEXAS MILE?

As long as you choose to make it! By auto, 80 seconds — by Trans-Texas Airways twin-engine 21-passenger DC-3 Starliner, only 20-seconds!

You can't measure the comfort and economy you'll enjoy on Trans-Texas Airways' fast, conveniently scheduled flights. Starliners serve more than 30 Texas cities and four border points with the finest air service — passenger, air mail and air freight.

Next time you plan a Texas trip . . . fly the route of the Starliners!

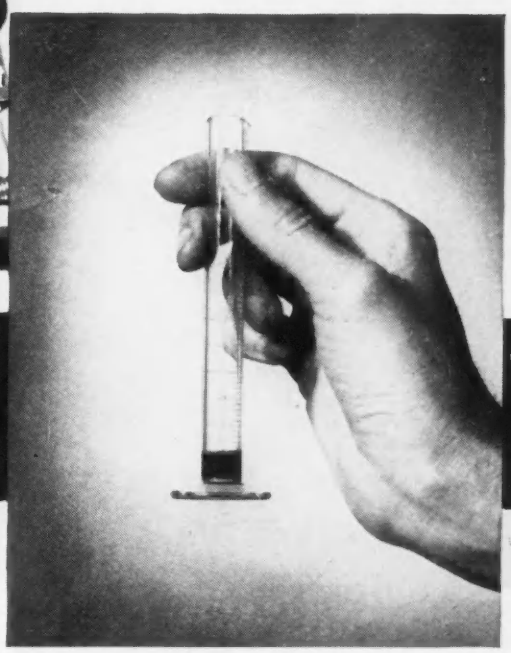
For information, call Trans-Texas Airways or your travel agent.

ROUTE OF THE STARLINERS

Travel time-tested Trans-Texas Airways

TRANS-TEXAS Airways

When IMPERMEX goes in---



FILTER LOSS goes down

(in either fresh or salt-water mud)

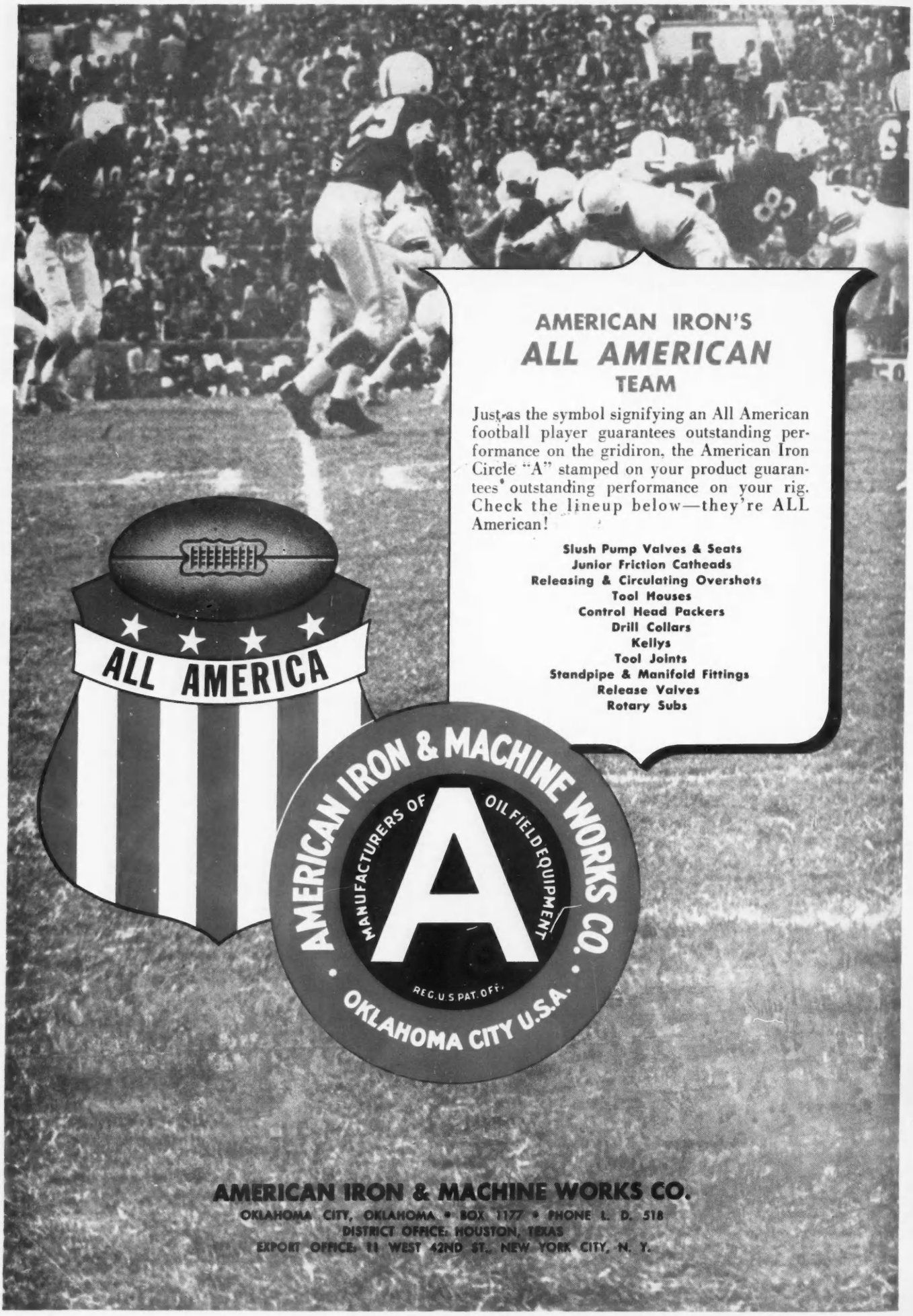
With Impermex, operators can make stable drilling mud with filter losses below 1 cc. API, even in the presence of such contaminants as salt, gypsum, anhydrite, and cement. Impermex makes good low-water-loss muds for drilling massive salt or when the make-up water is salty. Impermex muds retain their low-filter-loss properties when drilling gypsum or anhydrite. High pH-lime Impermex muds are not adversely affected even by large amounts of cement. With the use of medium or low pH Impermex muds, the adverse effect of cement may be overcome with conventional chemicals.

Since low filter loss reduces the hydration of many shales, Impermex muds minimize hole trouble with many potentially unstable formations. Cores taken with minimum filter-loss Impermex muds show little evidence of flushing with filtrate. The productive index of wells completed with such muds often shows great improvement over similar wells drilling with conventional muds. And, since these Impermex muds deposit thin flexible filter cakes, there is no interference with or obstruction to tools going in or coming out of the hole. There are many uses for Impermex—inquire about them from your Baroid Service engineer. He can tell you more about how Impermex can help you!

Baroid

BAROID SALES DIVISION
NATIONAL LEAD COMPANY
HOUSTON 1 · TULSA 3 · LOS ANGELES 12

COMPLETE DRILLING MUD SERVICE


AMERICAN IRON'S
ALL AMERICAN
TEAM
Just as the symbol signifying an All American football player guarantees outstanding performance on the gridiron, the American Iron Circle "A" stamped on your product guarantees outstanding performance on your rig. Check the lineup below—they're ALL American!
Slush Pump Valves & Seats
Junior Friction Catheads
Releasing & Circulating Overshots
Tool Houses
Control Head Packers
Drill Collars
Kellys
Tool Joints
Standpipe & Manifold Fittings
Release Valves
Rotary Subs
ALL AMERICA
AMERICAN IRON & MACHINE WORKS CO.
MANUFACTURERS OF
OIL FIELD EQUIPMENT
A
REG. U.S. PAT. OFF.
OKLAHOMA CITY U.S.A.
AMERICAN IRON & MACHINE WORKS CO.
OKLAHOMA CITY, OKLAHOMA • BOX 1177 • PHONE L. D. 518
DISTRICT OFFICE: HOUSTON, TEXAS
EXPORT OFFICE: 11 WEST 42ND ST., NEW YORK CITY, N. Y.

INDEX

SPECIALIZED FOR EXPLORATION, DRILLING, PRODUCING,
PIPE LINE OPERATIONS AND MANAGEMENT

VOLUME 132, No. 1, through VOLUME 133, No. 7
JANUARY-DECEMBER 1951

Published by

THE GULF PUBLISHING COMPANY

Box 2608, Houston (1), Texas

RAY L. DUDLEY, *President, Publisher*
WARREN L. BAKER, *Editorial Director*
L. J. LOGAN, *Associate Editor*
J. E. KASTROP, *Production Editor*
DONALD M. TAYLOR, *Pipe Line Editor*
ROBERT E. SPANN, *District Editor*
ANTHONY GIBBON, *District Editor*
MARY N. ZUBER, *Librarian*

A. L. BURNS, *General Manager*
AL REESE, *Managing Editor*
CECIL W. SMITH, *Statistical Editor*
W. B. COLVIN, *Drilling Editor*
DON KLIEWER, *International Editor*
GILBERT M. WILSON, *District Editor*
MARION DENNARD, *Editorial Assistant*
RUTH THOMPSON, *Editorial Assistant*

Advertising Staff
TOM W. NELSON, *Advertising Manager*
ROGER MOTHERAL, *Eastern Advertising Manager*
250 Park Ave., New York 17, N. Y.
NELSON BIGELOW, 250 Park Ave., New York 17, N. Y.
BILL WESTFALL, 1010 Euclid Ave., Cleveland 15, Ohio
H. G. FITZPATRICK, MARTIN HALLORAN
332 S. Michigan Ave., Chicago 14, Ill.
BILL ATCHESON, Hunt Bldg., Tulsa 3, Okla.
J. W. CURTS, W. W. Wilson Bldg.
Huntington Park, Calif.
CHARLES WYATT, DOUG CRAIG
3301 Buffalo Drive, Houston 6, Texas

Circulation Department
R. M. de SOMBRE, *Manager*

SUBJECTS COVERED IN INDEX

	Page		Page
Current Outlook and News Analysis	2	Production Hints	9
Drilling	5	Pipe Line	9
Drilling Hints	7	Pipe Line Hints	10
Production	7	International	11

SPECIAL ISSUES

Review Forecast	Feb. 15
Exploration	April
International Operations	July 15
West Texas-New Mexico	Sept.
Pipe Line	Nov.
Canadian	Dec.

REGULAR MONTHLY FEATURES

Advertisers' Index
Associations
Changing Panorama
Letters to the Editor
Equipment and Service Suppliers Notes
Men in the Industry News
New Books
New Equipment
New Literature
The Oil Man's Calendar
Squeaks from the Bull Wheel
Trading Post

CURRENT OUTLOOK AND NEWS ANALYSIS

Publisher's Page

Again We Say: Public Relations Program Pays.....Jan. 25
Ray L. Dudley
When We Reflect.....Feb. 1 21
Ray L. Dudley
Trumanites Smarter?.....Oct. 37
Ray L. Dudley

Editor's Page

A Tribute to Incentive.....Feb. 15 37
Warren L. Baker
Oil Needs Steel for All Operations.....Mar. 21
Warren L. Baker
Inequitable Oil Taxes Asked.....Mar. 21
Warren L. Baker
Need Greater for Depletion Allowance.....Apr. 37
Warren L. Baker
Will History Repeat?.....May 37
Warren L. Baker
Headed for Federal Control.....June 37
Warren L. Baker
Our Nation Sleeps.....July 1 37
Warren L. Baker
A New Producing Frontier.....Aug. 45
Warren L. Baker
Unrestricted Opportunity the Key.....Sept. 71
Warren L. Baker
Wildcatters—The American Hope.....Nov. 39
Warren L. Baker
Competition Will Solve Spraberry Problems.....Dec. 37
Warren L. Baker
Unrealistic Oil Prices Dangerous.....Dec. 37
Warren L. Baker

The Changing Panorama

Oil Lands for Truman; Was It a Fair Deal?.....Jan. 27
Military Still Takes Small Part of Supply.....Jan. 27
Defense Planned for Personnel, Property.....Jan. 27
Industry Must Keep Its Skilled Manpower.....Feb. 1 23
The Press Had a Part in Oil's Progress.....Feb. 1 23
Continental Pictures Its First 75 Years.....Feb. 1 23
Oil's On Spot When Treasury Is Clean.....Feb. 1 23
The Changing Panorama 1950-51—L. J. Logan.....Feb. 15 39
No Oil Sold Today; Must Go to Court.....Mar. 23
Gas Industry Shows Faith in U. S. Future.....Mar. 23
Cooperation Essential in Steel Allocations.....Apr. 39
Publicity Needed On Oil Industry Record.....Apr. 39
Ideology of Death.....Apr. 39
One Producer for Nine Wildcats Is True Ratio.....May 39
Shale Deposits Given Increased Attention.....May 39
Tax Ax May Snatch Many Autos Off Road.....May 39
Ike's Book Explains His Shyness in '48.....June 39
Truman Said It: Oil Man Should Boss NPC.....June 39
Labor Would Curtail Federal Encroachment.....June 39
Seeing Socialism.....June 39
Price Control Evils Grip Industry Again.....July 1 39
Saving More Oil Is Industry Challenge.....July 1 39
Pugnacious Pacifism.....July 1 39
Industry Workers Can Cite Multiple Benefits.....Aug. 47
Microwave Spreading in Pipe Line Industry.....Aug. 47
AAPG Head Calls for Aggressive Oil Quest.....Aug. 47
U. S. Tidelands Grab Only the Beginning.....Sept. 73
Industry Helps Solve Shortage of Sulfur.....Sept. 73
Sunray Sets Example by Collecting Scrap.....Sept. 73
Government Taxes Tax Imagination.....Oct. 39
Roll Some Heads and Your Taxes Will Fall.....Oct. 39
Let's Tell Gas Facts to Public.....Nov. 41
Human Relations of Major Importance.....Nov. 41
Filling of Vacancy on FPC Highly Important.....Dec. 39
Big Business Proves It Has Big Heart.....Dec. 39
Geophysicists Told to Use Tools Better.....Dec. 39
Conservation Walks With Cooperation.....Dec. 39

Report From The Observatory

Ray L. Dudley—Warren L. Baker
Oil Outlook Good.....Jan. 28
Peak Demand Enhances Outlook.....Feb. 1 24
Weather, Defense Intensify Demand.....Mar. 24
A Big Job Ahead.....Apr. 40
Oil Stocks May Become Excessive.....May 40
Danger Signals Continue to Grow.....June 40
Lower Producing Rates Ahead.....July 1 40
Industry Flirts With Danger.....Aug. 48
Supply Continues Above Demand.....Sept. 74
Iranian Crude Loss Offset.....Oct. 40
Uncertain Economic Picture Ahead.....Nov. 42
Outlook Improves As Stocks Drop.....Dec. 40

Petroleum Trends In The U. S.

Cecil W. Smith
Petroleum Trends in the U. S.....Jan. 30
Petroleum Trends in the U. S.....Feb. 1 26
Petroleum Trends in the U. S.....Mar. 26
Petroleum Trends in the U. S.....Apr. 42
Petroleum Trends in the U. S.....May 42
Petroleum Trends in the U. S.....June 42
Petroleum Trends in the U. S.....July 1 42
Petroleum Trends in the U. S.....Aug. 50
Petroleum Trends in the U. S.....Sept. 76
Petroleum Trends in the U. S.....Oct. 42
Petroleum Trends in the U. S.....Nov. 44
Petroleum Trends in the U. S.....Dec. 42

Completions

Completions Top 1948 Record.....Jan. 38
1950 Completions Hit Record 43,939.....Feb. 1 34
Completions Up 11.5 Percent.....Mar. 34
Completions 5 Percent Ahead of 1950.....Apr. 50
Completions Hold Lead Over 1950.....May 50
Completions Gains Over 1950 Period.....June 50
Completions 2.3 Percent Above 1950.....July 1 50
Completions Rise 4.1 Percent Over 1950 Period.....Aug. 77
Completions Continue At High Rate in July.....Sept. 84
Completions 3.4 Percent Ahead of 1950 Period.....Oct. 50
Year's Compeltions Head for New Peak.....Nov. 52
Record Assured for 1951 Drilling.....Dec. 50

MONTHLY NEWS ANALYSIS

Agriculture Is Among Oil's Best Customer.....Nov. 50
American Petroleum Institute:
Petroleum in Defense, Talks Highlight.....Nov. 47
Oil Industry Information Committee, Public Being Informed of Industry's Responsibility.....Mar. 28

Antitrust Litigation, Justice Department Drops Mother Hubbard ..... July 1 48
California:
Supply, Military Situation Again Drain, ... Apr. 48
Demand, High, for Oil, Reflects War ..... May 48
Emergency Oil, Able to Supply, Says Agency ..... Aug. 57
Production Need Cited for Continued Output in, ... Aug. 57
Canada:
Alberta to Be Slow in Permitting Gas Exports ..... May 48
Pipeline, Interprovincial, Larger Capacity Foreseen for, ... Aug. 57
Western Crude Now Priced to Compete ..... June 48
Carbonated Water May Increase Oil Recovery ..... Aug. 57
Companies, Earnings Misleading in Failing to Reflect Costs ..... Sept. 79
Controls:
Government, Parade in Uniform of U. S. Defense .... Nov. 48
Industry Controls Not in Sight, Says Brown ..... Jan. 32
Demand:
Texas Allowables Reflect Continuing Strong ..... Apr. 45
PAD Forecast 4 Percent Hike in '52 ..... June 46
9.5 Percent Hike Seen by Bureau of Mines ..... July 1 44
Depletion Allowance:
Depletion Clause, Truman on Schedule With Rap at, ... Feb. 1 29
Tax Law Dispute, Industry Faces Difficult Task in, .. Mar. 28
U. S. Treasury Department Report Argues Against Views ..... July 1 46
Diesel Fuel Oil Consumption Continues Steady Growth .... Jan. 36
Elk Hills, Tea Pot Dome May See More Activity ..... Apr. 48
Equipment, Oil Field, Put Under PAD Jurisdiction ..... Feb. 1 29
Exploration, New Concept in Oil Search Urged by AAPG President ..... Dec. 46
Exports, Increased, Reflect Abadan Refinery Shutdown .... Oct. 48
Federal Power Commission:
Phillips Case and FPC ..... May 47
Gas Price Fixing Against Public Good ..... June 48
Phillips Gas Hearing Testimony Received by FPC .. July 1 46
Phillips Case ..... Aug. 53
Phillips Case, Wants Early Court Review of, ... Sept. 81
Fuel Oil:
Diesel Fuel Oil Consumption Continues Steady Growth ..... Jan. 36
Locomotive, New, Consumes Heavy Types of Fuel Oils ..... Mar. 31
Prices, Unrealistic Restrictions Threaten, Market ... Sept. 79
Production, More, Needed to Avert Shortages ..... Oct. 46
Gas Utility Industry Plans $1500 Million Expenditures ... Aug. 54
Gasoline, Summer Motorists to Use Billion Gallons of, .. July 1 46
Heating Oil:
Enough New Burners Seen to Boost Use, ... May 47
Higher Demand May Offset Heavy Stocks ..... Nov. 48
Imports:
Congress Giving Attention to, Provisions, ... Mar. 31
Scramble Slated Among U. S. Importing Firms ..... Feb. 1 30
Iran—(See Persia)
Land-Purchase Practices of U. S. Government (in N. Dakota) ..... July 1 44
Locomotive, New, Consumes Heavy Types of Fuel Oils ... Mar. 31
Manpower:
Industry Feels Pinch of Calls to Military Service ..... Jan. 36
PAD Will Assist in Gaining Deferments for Key Oil Men ..... Sept. 81
Enlargement of Armed Forces Would Hamper Oil Industry ..... Dec. 46
Materials: (also see Steel)
NPA's Material Plan May Be in Operation July 1 .... Mar. 28
To Be Scarcer But Eventually Adequate ..... May 45
"Set Aside," MRO Programs Exempt ..... May 45
Materials Control Practices—J. L. Stackpole ..... July 1 61
Priorities Program Aids Foreign Oil Operations ..... Sept. 82
Industry Threatened by Shortage of Metal Goods .... Jan. 34
Nickel Cutback Effects to Be Felt by Industry ..... Oct. 45
Metal Goods, Industry Threatened by Shortage of, ... Jan. 34
Million-Barrel-Per-Day Expansion Studies ..... July 1 48
Mobilization and Petroleum Industry ..... Mar. 28
Montana Well Arouses New Interest in Williston Basin ... Aug. 57
National Production Authority's Material Plan May Be in Operation July 1 ..... Mar. 28
Natural Gas:
Phillips Case and FPC ..... May 47
Price Fixing Against Public Good, Says Murray ..... June 48
Phillips Case ..... Aug. 53
Gas Utility Industry Plans $1500 Million Expenditure . Aug. 54
Phillips Gas Hearing Testimony Received by FPC ... July 1 46
Expansion Slowdown Ordered, by PAD, for Natural Gas Suppliers ..... Sept. 82
FPC Wants Early Court Review of Phillips Case ..... Sept. 81
Flaring, Troubles Texas Rail Commission ..... Oct. 45
Nevada, Interest High in, Activity Despite Failure ..... Jan. 36
Nickel Cutback Effect to Be Felt by Industry ..... Oct. 45
North Dakota:
First Oil Well Appears Important ..... May 47
Oil Discovery May Change Land-Purchase Practices . July 1 44
Oil Progress Week, Industry Tells Its Story to Public This Month ..... Oct. 46
Oklahoma:
Conservation, Significant Steps Made in ..... July 1 48
Pool Speaks for Soundness of Unitization ..... Mar. 31
Persia (Iran):
Increased Exports Reflect Abadan Refinery Shutdown . Oct. 48
Petroleum Administration for Defense:
Administrators, Top, for Staff Selected ..... Jan. 32
Oil Field Equipment Put Under PAD Jurisdiction ... Feb. 1 29
Pipelines, Survey, Would Determine Which Lines to Construct ..... Feb. 1 32
Forecast 4 Percent Hike Early in '52 ..... June 46
Manpower, Will Assist in Gaining Deferments for Key Oil Men ..... Sept. 81
Tubular Goods, PAD Revised Forms Are Required to Purchase, ... Sept. 82
Rationing Not in Next Year Expected by PAD Director ..... Dec. 48
Line Pipe Lack Threatens PAD Ban on Gas for East . Aug. 54
Pipe Line:
Line Pipe Lack Threatens PAD on Gas for East ..... Aug. 54
Expansion Need Cited in PAD Steel Report ..... Aug. 54
Ratables Purchase, Texas Commission Denied Authority in Col.-Tex. Case ..... July 1 46
Private, Not in ICC Domain, Says High Court ..... June 46
Platte Line and Example of Oil's Great Benefit, Rocky Mountain ..... Nov. 47
Prices:
Avoid Inflexible Controls on Prices, Oil Men Warn .... Apr. 46
Freeze at Jan. 1 Levels Wouldn't Cripple ..... Feb. 1 30
High Court Sides With Oil Firm in Price Case ..... Feb. 1 30
Jittery as U. S. Mobilization Hastened ..... Jan. 32
Crude, Independents Ask Action on Situation ..... Nov. 47
Order Involves No Major Change in Postings ..... June 46
Priorities Program, NPA, Aids Foreign Oil Operations ... Sept. 82
Production:
Donnell Points Out Road to Adequate Production .... Apr. 46
Million-Barrel-Per-Day Expansion Studies ..... July 1 48
U. S. Crude Hike Results From Curtailed Iran Output ..... Sept. 79
Public Relations:
Oil Progress Week, Industry Tells Its Story to Public This Month ..... Oct. 46
Refineries, Gasoline Remains Choice Product of, ... Oct. 48
Rocky Mountain, Platte Line an Example of Oil's Great Benefit ..... Nov. 47
Saudi Arabia, American Concession in, Not in Jeopardy .... May 48
Steel:
Industry Promised Enough Steel for 44,000 Wells ... Feb. 1 29
Drilling Program Blocked by Short Supply ..... Apr. 39
For Fourth Quarter Continues in Tight Supply ... Sept. 81
To Remain Scarce for Reminder of Year ..... June 45
Chances May Be Improved for Getting Needed Steel . July 1 44
Line Pipe Lack Threatens PAD on Gas for East ..... Aug. 54
Industry's Chances Slim of Getting Enough ..... Oct. 45
Priorities Program, NPA, Aids Foreign Oil Operations ..... Sept. 82
Tubular Goods, PAD Revised Form Are Required to Purchase ..... Sept. 82
Petroleum Faces Critical Pinch for More ..... Dec. 45
Tubular Allocations Probe Is Planned by House Group . Dec. 45
(Also see Materials)
Synthetic Plant, U. S., Plans for, Hit by R. E. Wilson .... Oct. 48
Tankers:
Pool Program May Bring New Rate Schedule ..... Feb. 1 32
Fleet Shrinkage Halted Only Temporarily ..... Apr. 48
Tar Sands, Economical Extraction of Oils from, Likely ... Aug. 57
Tax Law Dispute, Industry Faces Difficult Task in, ... Mar. 28
Tetraethyl Lead, Additional Cuts in Quotas of, Feared, .. Oct. 46
Texas:
Natural Gas to Stimulate Industry in California ..... May 48
Production Allowable, Slashed for Second Month in Row ..... Dec. 48
Tidelands:
States Consider Truce on Tidelands Argument ..... Feb. 1 29
Congress May Dare Veto With Tidelands Quitclaim .. Mar. 31
Legislation, Federal Quitclaim Stressed in ..... Apr. 48
Tidelands Gabble Goes on As Operators Sit, Suffer .... May 47
No Solution in Sight for Tangle ..... June 46
Bill, House Starts Bill on Its Way to Truman Veto .. Aug. 54
No Final Senate Action on Tidelands Is Expected ..... Oct. 48
Issue Remains Controversial Center ..... Dec. 48
Unitization, Oklahoma Pool Speaks for Soundness ..... Mar. 31
U. S. Corps of Engineers, Land Purchase Practices of U. S. Government in North Dakota ..... July 1 44
Williston Basin, Montana Well Arouses New Interest in, . Aug. 57
World Supply, Shortage Caused by Iranian Shutdown, End of Seen ..... Nov. 50

CURRENT OUTLOOK

Atomic Warfare

Atomic Warfare and the Oil Industry ..... Oct. 64
Robert C. Wing, Cmdr., U. S. Navy

Company Operations

Company Operations Reflect Competition. (Data by Companies on Production, Refining, Wells Completed, Acreage Held, Etc.) ..... June 61
L. J. Logan

Conservation

Fewer Flares Light Texas Skies. (Gas Processing Plants Save Natural Gas) ..... Feb. 1 39
L. J. Logan
Scurry Conservation Plans Envisage Billion Barrel Payoff ..... Sept. 100
Map—Scurry County—Configuration of Top of Canyon Reef Fields ..... Sept. 101
Elk City Operators Unite for Conservation. (Unitization for Gas Cycling and Pressure Maintenance) ..... Oct. 55
Anthony Gibbon

Costs

Geophysical Costs Outrun Prices ..... May 55
J. E. Kastrop

Demand for Petroleum

Petroleum Demand to Require Record U. S. Production . Feb. 15 42
Petroleum Supply and Demand—Table ..... Feb. 15 42
Oil in Strong Demand ..... May 61
L. J. Logan—C. W. Smith
Continuing Strong Demand Requires Sustained Operations .. Aug. 58
L. J. Logan
Mounting Exports Increase Oil Demand in U. S. ..... Nov. 64
Robert E. Spann
PAD Forecasts: 4.4 Percent Demand Hike in 1952 ..... Dec. 57

Discovery

Industry Faces Big Future Discovery Task ..... June 55
Warren L. Baker

Drilling
World Oil Predicts: 44,965 New Wells This Year (1951)..Aug. 65
Permian Basin Maintains Position as Drilling Leader....Sept. 106
C. W. Smith
Record Assured for 1951 Drilling.....Dec. 50

Economics
Continued Growth of Oil Industry Depends on Unencumbered Economy .....Sept. 89
Interview—A. E. Bradshaw

Employee Relations
Better Bosses—The Humble Way.....Mar. 44
Al Reese
Junior Directors Help in Company Management.....Aug. 76
Professional Engineers and Labor Unions.....Apr. 60
James C. Birtell
Your Company Magazine.....May 68
Al Reese

Exports—Imports
Exports and Imports to Be in Sharp Contrast.....Feb. 15 55
Robert E. Spann
U. S. Net Imports Shrink As Exports Rise.....Nov. 63
Mounting Exports Increase Oil Demand in U. S.....Nov. 64
Robert E. Spann
Canadian Exports No 'If'—but 'How Soon'.....Dec. 55

Geophysical
Geophysical Costs Outrun Prices.....May 55
J. E. Kastrop

Human Interest Articles
See Spindletop
Making Dreams Come Alive Was Genius of Edgar Davis .....Nov. 58

Human Relations
See—Employee Relations and Public Relations

Imports
See Exports

Interviews with Industry Leaders
Hardships Mount as Steel Shortage Worsens.....Jan. 45
Russell B. Brown
Continued Growth of Oil Industry Depends on Unencumbered Economy .....Sept. 89
A. E. Bradshaw
Industry Must Guard Against Government Encroachment.Nov. 57
Frank M. Porter
Be Prepared, Industry Urged.....Feb. 1 32
K. S. Adams

Investment In Petroleum Industry
$32.0 Billion Investment Makes Oil Fourth Largest U. S. Industry.....Aug. 73

Legislation
Legislative Outlook Poses Problems for Oil Industry....Feb. 15 67
L. Dan Jones

Management
Better Bosses—The Humble Way.....Mar. 44
Al Reese
Factors Involved in Forming Spacing Units.....Mar. 48
C. B. Caruthers
Materials Control Practices.....July 1 61
J. L. Stackpole
Junior Directors Help in Company Management.....Aug. 76
Conserve Manpower and Materials.....Dec. 62
H. H. Anderson

Manpower
Manpower Shortage Troubles Drilling Industry.....Oct. 63
Don Kliewer
Conserve Manpower and Materials.....Dec. 62
H. H. Anderson

Maps
Permian Basin (Counties and Fields).....Sept. 94
Scurry County—Configuration of Top of Canyon Reef Fields.....Sept. 101

Materials
Materials Control Practices.....July 1 61
J. L. Stackpole
Conserve Manpower and Materials.....Dec. 62
H. H. Anderson

Natural Gas
Fewer Flares Light Texas Skies. (Gas Processing Plants Save Natural Gas).....Feb. 1 39
L. J. Logan

Outlook
What's Ahead in '51.....Jan. 43
Be Prepared, Industry Urged.....Feb. 1 32
K. S. Adams

Permian Basin
The Rancher's Side. (Oil Companies' Obligations to West Texas Ranchers).....Mar. 39
What New Reserves Can We Expect to Find in the Permian Basin? .....Sept. 91
Dr. Sidon Harris
Map—Permian Basin (Counties and Fields).....Sept. 94
Map—Scurry County—Configuration of Top of Canyon Reef Fields.....Sept. 101
Permian Basin Maintains Position as Drilling Leader....Sept. 106
C. W. Smith
Permian Basin Yields Fifth of U. S. Oil Production.....Sept. 107
L. J. Logan

Pipe Line
Functions of Common Carrier Pipe Lines.....May 64
Anthony Gibbon

Prices
Petroleum Prices Under Pressure of Demand, Cost.....Feb. 15 60
Price-Wage Controls Cut Production.....Mar. 32
L. J. Logan

Proration
Improved Proration Would Expand Reserves.....July 1 68
Park Jones

Public Relations
Oil Joins Other Industries in Upholding Free Enterprise.Feb. 1 44
Henry Ozanne
The Rancher's Side (In West Texas Development).....Mar. 39

Research
Texas Research Center Aids Oil Industry.....July 1 69
Fred D. Thompson

Reserves
Reserves Lag Behind Rising Oil Use.....Apr. 64
L. J. Logan
More U. S. Oil Finding Needed.....Apr. 70
Industry Faces Big Future Discovery Task.....June 55
Warren L. Baker
Improved Proration Would Expand Reserves.....July 1 68
Park Jones
What New Reserves Can We Expect to Find in the Permian Basin? .....Sept. 91
Dr. Sidon Harris
Permian Basin Yields Fifth of U. S. Oil Production.....Sept. 107
L. J. Logan
U. S. May Produce 8 Million Barrels Daily by 1955.....Sept. 111
Robert E. Spann

Safety
Driver Education Program—Humble Takes the Highways to Safety .....Apr. 55
Al Reese
Safety Program Can Promote Multiple Benefits.....July 1 55
D. M. Farrell
Safety Record Best in Industry History.....July 1 66

Secondary Recovery
Bureau of Mines Role in Secondary Recovery.
Part I .....Jan. 56
Part II (Conclusion).....Feb. 1 50
R. A. Cattell
World's Largest Water-Flood Project to Save 140 Million Barrels of Oil.....Oct. 60
Anthony Gibbon

Spindletop
Captain Lucas—Titan of Spindletop.....Jan. 254
Spindletop Given High Place in History of Industry.....Jan. 225
Spindletop First and Among Best of Gulf Coast Fields....Jan. 228
L. J. Logan
Spindletop—The Giants Came Home.....Feb. 1 41
Spindletop's Production Peaks: 1902 and 1927.....Jan. 232
Rotary System of Drilling Pioneered at Spindletop.....Jan. 233
J. E. Kastrop

Statistics
Salient Annual Statistics of the U. S.....Feb. 15 40

Steel
Hardships Mount as Steel Shortage Worsens.....Jan. 45
Interview—Russell B. Brown
Steel Shortage to Restrict Industry Operations.....Aug. 71
Robert E. Spann
Steel Shortage to Continue.....Nov. 68

Stocks
Stocks of Oils Need Expansion.....Feb. 15 64

Synthetics
Oil From Coal Not Needed.....Nov. 59
Don Kliewer
'Last Drop' of Oil Sighted.....Dec. 61
Robert E. Spann

Taxes
Tax Problems in the Oil and Gas Industry.....Jan. 48
James R. Felt

EXPLORATION

Discoveries, U. S., By Months (Significant Data on Each)

U. S. Oil, Distillate and Gas Discoveries and Extensions in Nov., 1950.....Jan. 84
U. S. Oil, Distillate and Gas Discoveries and Extensions in Dec., 1950.....Feb. 1 80
U. S. Oil, Distillate and Gas Discoveries and Extensions in Jan., 1951.....Mar. 76
U. S. Oil, Distillate and Gas Discoveries and Extensions in Feb., 1951.....Apr. 121
U. S. Oil, Distillate and Gas Discoveries and Extensions in Mar., 1951.....May 90
U. S. Oil, Distillate and Gas Discoveries and Extensions in Apr., 1951.....June 94
U. S. Oil, Distillate and Gas Discoveries and Extensions in May, 1951.....July 1 90
U. S. Oil, Distillate and Gas Discoveries and Extensions in June, 1951.....Aug. 108
U. S. Oil, Distillate and Gas Discoveries and Extensions in July, 1951.....Sept. 154
U. S. Oil, Distillate and Gas Discoveries and Extensions in Aug., 1951.....Oct. 104

U. S. Oil, Distillate and Gas Discoveries and Extensions in Sept., 1951 ..... Nov. 104
U. S. Oil, Distillate and Gas Discoveries and Extensions in Oct., 1951 ..... Dec. 102

Exploratory Drilling In U. S. (Annual Statistics)

Exploration Record Set in Drilling 8745 Tests ..... Feb. 15 73
Cecil W. Smith
Results of Exploratory Drilling in U. S., in 1950, by States, and Comparison With Earlier Years .... Feb. 15 74
Wildcatting—Table—Ratio of Wildcatting to All Drilling and Proportion of Wildcats Discovering New Fields, by Districts, 1937-1950 ..... Feb. 15 76
Prospecting Outlook Emphasizes Deep Drilling ..... Feb. 15 79

Exploratory Drilling in U. S. (Monthly Statistics)

Exploration Record Shattered ..... Jan. 80
1950 Exploration 13 Percent Above Record ..... Feb. 1 76
Exploration Makes Fast Start ..... Mar. 76
Exploration 13 Percent Ahead of 1950 ..... Apr. 117
Exploration Quickens After Lull ..... May 89
Exploration 20 Percent Above 1950 Level ..... June 90
Exploration Sets All-Time Record ..... July 1 88
Exploration 17.8 Percent Above 1950 Period ..... Aug. 106
Exploration 21.8 Percent Ahead of 1950 Period ..... Sept. 152
Exploration Reaches High of 1027 Wells in August ..... Oct. 100
Exploration in September Accounts for 1008 Wells ..... Nov. 102
Exploration 22.4 Percent Ahead of 1950 Period ..... Dec. 100

General

Use Imagination, Oil Finders Advised ..... Jan. 68
Petroleum Geology Pioneered in Tennessee ..... Feb. 1 66
Excuses to Drill (More Wildcatting Urged) ..... Apr. 73
Ira H. Cram
Avenues for Progress in Geology and Geophysics ..... Apr. 102
Paul Weaver

Geological Articles—Fundamental

Sand and Gravel in Deep-Water Deposits ..... Jan. 61
Francis P. Shepard
Clay Mineralogy and the Petroleum Industry ..... Mar. 61
Ralph E. Grim
Sedimentary Basins and Oil Occurrence ..... Mar. 71
L. G. Weeks
Oil Is How You Find It.
Part I ..... Oct. 93
Part II ..... Nov. 95
Dr. Robert W. Wheeler

Geological Tools and Methods—New

New Method Logs Dip and Strike of Subsurface Formations ..... Feb. 1 57
Trigonometrical and Graphical Solutions of Problems in Structural Mapping ..... Nov. 94

Geophysical Operating Problems

Swamp Buggy (Used in Exploratory Work) ..... Jan. 71
Geophysical Crews More Active During 1950 ..... Feb. 15 78
Weathering and Other Surface Shooting Problems ..... Mar. 57
Neal Clayton
Accuracy Factors in Geophysical Prospecting.
Par I. ..... Apr. 84
Part II (Conclusion) ..... May 73
Neal J. Smith
Velocity Information Needed for Seismic Interpretation .. June 86
John W. Daly
Evaluation of Magnetics in the Delaware Basin ..... Aug. 91
H. Wayne Hoylman
Geophysical Operations in the Canadian Bush ..... Dec. 81
J. K. MacMillan
Western Anadarko Basin Geophysical Problems ..... Dec. 86
Neal Clayton

Geophysical Tools and Methods—New

A Two-Level Aeromagnetic Profile Across Western Texas. Feb. 1 62
H. Wayne Hoylman
Avenues for Progress in Geology and Geophysics ..... Apr. 102
Paul Weaver
New Developments in Geophysical Prospecting ..... Apr. 90
Dr. L. J. Neuman
Better Geophysical Interpretations—Whose Responsibility? ..... Apr. 80
Dr. Roland F. Beers
Regional Stratigraphic Analysis As a Guide to Geophysical Exploration ..... Apr. 99
W. C. Krumbein
Gravity Exploration for Reefs and Other Porosity Maxima ..... June 78
H. Klaus—J. C. Hughes
Evaluation of Magnetics in the Delaware Basin ..... Aug. 91
H. Wayne Hoylman
Aerial Magnetic Oil Discoveries, in South Central Texas .. Nov. 85
W. P. Jenny

Geophysics—General

Exploration Geophysics . . . Yesterday . . . Today . . . Tomorrow ..... Apr. 76
Dr. W. M. Rust, Jr.
More Geophysical Crews Active During 1950 ..... Feb. 15 78

Maps

West Texas Permian Basin—Regional Subsurface Map .. Sept. 144
San Diego Trough ..... Jan. 64
World Coarse Sand in Deep Water ..... Jan. 62

Reefs

Oil Possibilities of Niagaran Reefs in Illinois ..... Jan. 74
Dr. Alfred H. Bell
Gravity Exploration for Reefs and Other Porosity Maxima ..... June 78
H. Klaus—J. C. Hughes
Pennsylvanian Reef and Non-Reef Development in West Texas ..... Sept. 142
J. H. Bartley

Regional Development and Studies

Oil Possibilities of Niagaran Reefs in Illinois ..... Jan. 74
Dr. Alfred H. Bell
Petroleum Geology Pioneered in Tennessee ..... Feb. 1 66
Regional Study Reveals Colorado Oil Prospects ..... Feb. 1 72
Dr. Clark F. Barb
Prospecting Outlook Emphasizes Deep Drilling ..... Feb. 15 79
Wyoming Possibilities Enhanced by Variety of Oil Traps ... May 80
Horace D. Thomas
Discovery Heightens Interest in North Dakota Geology.
Part I ..... June 73
Part II (Conclusion) ..... July 1 83
Dr. Wilson M. Laird
Significant Developments in the Four Corners Area .... July 1 73
J. L. Tatum
Williston Basin Oil Possibilities ..... July 1 78
G. Wendell Smith
Evaluation of Magnetics in the Delaware Basin (West Texas-New Mexico) ..... Aug. 91
H. Wayne Hoylman
Eastern Kansas—Developments and Prospects ..... Aug. 100
Dr. J. M. Jewett
The Spraberry Play in West Texas ..... Sept. 125
R. C. Senning
Deep Structures and Multi-Pay Fields Offer Significant Developments in West Texas ..... Sept. 138
John C. Ryan—Harward L. Fisher
What New Reserves Can We Expect to Find in the Permian Basin? ..... Sept. 91
Dr. Sidon Harris
Pennsylvanian Reef and Non-Reef Development in West Texas ..... Sept. 142
J. H. Bartley
Map—West Texas Permian Basin—Regional Subsurface Map ..... Sept. 144
Pre-Permian Pays Productive in New Mexico's New Fields ..... Sept. 146
Glen Staley
Pre-Pennsylvanian Rocks Along the Front Range of Colorado ..... Oct. 88
John C. Maher
Stratigraphy of Key Arkansas Deep Test ..... Oct. 83
Robert J. Lantz
Aerial Magnetic Oil Discoveries, in South Central Texas .. Nov. 85
W. P. Jenny
Geophysical Operations in the Canadian Bush ..... Dec. 81
J. K. MacMillan
Western Anadarko Basin Geophysical Problems ..... Dec. 86
Neal Clayton
South Ceres—Oklahoma's Oddest Shoestring Field ..... Dec. 92
E. P. Neal

Societies and Associations

AAPG-SEP-SEG—Exploration Societies Hold Annual Meeting ..... Apr. 109
A. Gibbon

Wildcat Wells

Excuses to Drill ..... Apr. 73
Ira H. Cram

DRILLING

Acidizing

Acidizing Practices in Canyon Reef Section, Scurry County ..... Mar. 100
G. D. Simon

Air Drilling

Air Drilling the Spraberry Sand ..... Sept. 169
O. H. Berry
Wilshire Conducts Second Air Drilling Venture ..... Dec. 126
O. H. Berry—Wm. Queensbury, Jr.

Barge

Rowan's Barge Rig 13 ..... Nov. 119
John A. Boatman

Bits

Analysis of Rock Bit Performance Data ..... Sept. 193
Henry B. Woods
A Drillability Classification of Geological Formations ..... Oct. 125
Albert L. Head, Jr.

Boilers

Reclaimable Cement Insulates Boilers ..... June 120

Casing String

A Review of Casing String Design, Principles, and Practice.
Part I ..... July 1 113
Part II (Conclusion) ..... Oct. 141
J. O. Hills

Cathead

Coddle That Cathead! ..... Feb. 1 106
Ben F. Kelley

Cementing

Primary Cementing of Casing in Rotary-Drilled Wells .... Apr. 153
Waldo L. Grossman
Reclaimable Cement Insulates Boilers ..... June 120

Completions

Completions and Footage At Highest Levels ..... Feb. 15 94
Thin Oil Column Completions ..... May 99
R. G. Loper

Contractors
Contractors' Cost Clinic
No. I—Unitized Mud Pumps Increase Flexibility..July 1 107
A. W. Shaw
No. II—Shop-Made Preheater Cuts Fuel Costs, Aids Boiler Efficiency ..... Apg. 125
No. III—Locating Physical Failure in Drill Pipe.....Sept. 196
Paul D. Shaffer
No. IV—Insurance Problems of the Drilling Contractor ..... Oct. 117
J. H. Johnson
No. V—Crooked Holes. ..... Nov. 142
Bruno Schabarum
Current Problems of the Drilling Contractor..... Mar. 83
A. W. Thompson
Expenses Skyrocket—Revenue Per Foot Falls in Contractors' Battle for Existence..... Sept. 179
W. B. Colvin

Coring
Cable Tool Coring..... Apr. 147
R. C. Glover
Latest Application of Diamond Coring..... Sept. 173
R. W. Stuart

Corrosion
Removing Mill Scale Increases Pipe Service Life..... Oct. 140
Ralph Irving

Cost
Application of Drilling Cost Analysis..... Apr. 160
G. C. MacDonald

Depth
Drilling Depth Records Bested in Eight Areas..... Feb. 15 122

Diesel
Diesel Electric Rig Designed for Medium or Deep Drilling. May 111
Gilbert M. Wilson

Drill Collar
Controlled Tong Torque Increases Drill Collar Service.... Nov. 127

Drill Stem
Fatigue Testing and Development of Drill Pipe to Tool Joint Connections..... Jan. 104
William S. Bachman
Reverse Circulating of Drill-Stem Tests in Open Hole... Feb. 1 102
J. E. Smith

Drill String
Buckling of Rotary Drilling Strings.
Part I ..... Mar. 105
Part II ..... Apr. 137
Part III ..... May 122
Part IV (Conclusion) ..... June 124
Arthur Lubinski

Earthquake
Anti-Earthquake Damage Operations..... Feb. 1 83
D. L. Roberts

Engine
Auxiliary Radiator Cools Gas Engine..... June 146
Engineered Power Units Simplify Setup..... June 132
Engine Shelter Supports Speed Disassembly..... Feb. 1 115
Drilling Engines Cooled With Own Waste Heat..... Dec. 146
Fred M. Burt

Equipment
New Drilling Equipment Offered Industry in 1950..... Feb. 15 105
W. S. Crake
Hazards in Outdated Drilling Equipment Costs..... Mar. 98
F. W. Brigance
Storage Pockets for Subs..... Nov. 153

Fishing
New Fishing Techniques Developed for Wire Line Devices ..... July 1 132
R. R. Rieke
The Evolution of Fishing Techniques..... Nov. 132
D. U. Skinner

Flow Line
Unitized Flow Line Aids Rigging-Up and Handling of Drilling Fluid ..... June 119
W. B. Colvin

Fluid Drive
Fluid Drives for Drilling Rigs..... Jan. 87
Kenneth N. Mills

Forecast
Drilling Forecast Is for 4 Percent More Wells..... Feb. 15 91
Elton Sterrett

Gas
Gas Replaces Drilling Mud in San Juan Basin Operations. Aug. 128
Gilbert M. Wilson

Generator
Portability and Compactness Feature Generator House and Mud Tank Units..... Feb. 1 96
Gilbert M. Wilson

Graphics—World Oil
Mud Hose Care..... Jan. 120
Cutting Wire Line..... Feb. 1 88
Suction Hose Care..... Mar. 88
Mud Pump Care..... Apr. 136
Bearing Care ..... May 110
Mud Chemical Care..... June 118
Drill Collar Care..... July 1 112
Discharge Line Care..... Aug. 148
Blowout Preventer Care..... Sept. 178
Mud Pump Care..... Oct. 124
Pump Piston and Rod Care..... Nov. 126
Sub Care ..... Dec. 120

Log Analyzer
Log Analyzer Simplifies Electric Log Quantitative Calculations ..... Aug. 143
Dr. R. G. Hamilton
Simultaneous Radiation Logging in Kansas..... Nov. 146
V. J. Mercier
Shielded-Electrode Method ..... Dec. 134
Hubert Guyod

Lost Circulation
Down the Hole Pressure Surges and Their Effect on Loss of Circulation..... June 107
W. C. Goins, Jr., and Others

Measuring Line
Adjustable Measuring Line Supports..... Jan. 119
Gilbert M. Wilson

Mousehole
Mousehole Speeds Running Singles..... Apr. 146

Motors
Operating Guide for A.D. Drilling Rig Motors..... Mar. 89
Louis J. Murphy
Getting Most From D.C. Drilling Motors..... May 118
Louis J. Murphy

Mud
Costs, Appraisal of Drilling Mud Costs.
Part I ..... Dec. 127
Victor V. Horner
Horizontal Centrifuge Desands Contaminated Mud..... Mar. 99
A. Gibbon
The Effect of Mud Filtrates and Mud Particles Upon the Permeabilities of Cores.
Part I ..... July 1 125
Part II (Conclusion) ..... Aug. 152
T. H. Nowak—R. F. Krueger

Pumps—Mud
Contractors' Cost Clinic No. I.
Unitized Mud Pumps Increase Flexibility..... July 1 107
A. W. Shaw
Effect of Mud Pump Surges..... Jan. 94
Henry Charles Wachtman, Jr.
Investigation of Torque Converter Drives on Mud Pumps.. Sept. 189
David F. Toomey—Ernest G. Chilton
Stability of Mud in High-Temperature Holes Shown by Surface Tests ..... Aug. 149
G. R. Gray—A. C. Cramer—K. K. Litman
Tank—Portability and Compactness Feature Generator House and Mud Tank Units..... Feb. 1 96
Gilbert M. Wilson
Tank—Unitizing a Mud Tank..... Oct. 121
John C. Albright
Horizontal Centrifuge Desands Contaminated Mud..... Mar. 99
A. Gibbon

Nomograms
Nomograms for Quantitative Analysis of Electrical Logs.. Apr. 131

Operating Problems
Canada's Subzero Temperatures Create Complex Operating Problems ..... Dec. 115
D. J. Elliott

Pipe Rack
Better Designed Pipe Rack Speeds Rigging-Up..... June 139
Gilbert M. Wilson

Plugged Wells
Strata Variants Create Reactions in Plugged Wells..... Dec. 151
F. R. Cozzens

Pontoon Ferry
Pontoon Ferry Eliminates Expensive Bridging Operation ..... Feb. 1 98
E. Sterrett

Power Plant
Cantilever Shelter Protects Rig Power Plant..... June 142
John C. Albright

Pump
Unusual Causes of Steam Pump Troubles..... Feb. 1 89
Roy E. Edwards

Radiator
Auxiliary Radiator Cools Gas Engine..... June 146

Recorder
Automatic Recorder Improves Drilling Efficiency..... Dec. 121
W. B. Colvin

Reefs
Acidizing Practices in Canyon Reef Section, Scurry County ..... Mar. 100
G. D. Simon

Rigs
Rigs in Operation Increase 5 Percent During 1950..... Feb. 15 100
Substructure Design Reduces Rigging Time..... Feb. 1 100
J. C. Albright
Diesel Electric Rig Designed for Medium or Deep Drilling. May 111
Substructure Support Facilitates Rig Handling..... Oct. 119
Gilbert M. Wilson

Rotary Percussion
Rotary Percussion Drilling..... Sept. 182
J. A. Wanamaker

Safety

Drilling Safety Factors Cited....Feb. 1 104

Seismograph Shot Holes

Wet Auger Drilling of Seismograph Shot Holes....Nov. 138
John M. Camp

Spraberry Sand

See Air Drilling

Tubular Goods

New Technique for Tubular Goods Inspection....Oct. 120
Fred Huhn

Wall Collapse

Time-Dependent Strains Around Uncased Holes....July 1 134
A. D. Topping

Water Tank

Water Tank Makes Engine Foundation....July 1 124
Gilbert M. Wilson

Weather Conditions

Canada's Subzero Temperatures Create Complex Operating Problems....Dec. 115
D. J. Elliott

Well Logging

See Logging

Wire Rope

Care and Maintenance of Wire Rope....Feb. 1 108
R. D. McNutt

Enlarging Rotary Drilling Rope Reduces Ton-Mile Costs..Apr. 151
L. C. Torell

Abuses of Wire Ropes....June 114
Charles M. Zerr

Substructure Support Facilitates Rig Handling....Oct. 119
Gilbert M. Wilson

DRILLING HINTS

HOW TO DO IT!

Guard Flexible Suction Hose in Transit....Jan. 122
Take Up Slack in Canvas Engine Roofing....Jan. 122
Handle Lube Oil Supply....Jan. 124
Unitize Casing and Bit....Jan. 124
Guide Rotary Hose to Prevent Scuffs....Jan. 126
Add Steam Drilling Engine Exhaust Line....Jan. 128
Insure Radiator Cooling....Jan. 130
Protect Pistons and Rods....Jan. 130
Trap Air in Pump Suction....Jan. 132
Manifold Pump Discharge....Jan. 134
Reinforce Mud Tank Top with Fluid Header....Feb. 1 120
Hang Metal Walkway on Elevated Mud Tank....Feb. 1 120
Brace Flexible Mud Line....Feb. 1 122
Add Pump Stroke Counter....Feb. 1 122
Construct Hinged Lid for Mouse Hole....Feb. 1 124
Build Flush-Mounted Lifting Sub Rack....Feb. 1 124
Use Siphon Suction Pipe....Feb. 1 126
Install Water Softener....Feb. 1 126
Eliminate Standpipe on Workover Rigs....Feb. 1 128
Change Sparkplugs on Hot Engine....Feb. 1 128
Dispense Drilling Mud Treating Chemicals....Feb. 15 128
Indicate Water Flow Through Brake Drums....Feb. 15 128
Mount Exhaust Stack for Doghouse Heater....Feb. 15 130
Make Simple Braces for Engine Walkaround....Feb. 15 132
Support Mud Suction Line....Feb. 15 134
Unitize Guard Rails of Elevated Walkway....Mar. 118
Fabricate Tool Rack and Storage Room....Mar. 118
Guard Blowout Preventers....Mar. 120
Prevent Wire Line Hazard....Mar. 120
Measure Rate of Drilling....Mar. 122
Make Door for Enclosure....Mar. 122
Coordinate Operation of Drilling Mud Pump....Mar. 124
Protect Wire Anchor Line....Mar. 126
Align Pipe Rack Sections....Mar. 126
Unitize Measuring Reel for Portability....Mar. 128
Mount Piston Rod Lubricating System....Mar. 129
Install Auxiliary Units....Mar. 130
Unitize Mud Guns and Pit Jet Assembly....Apr. 166
Fabricate All-Weather Enclosure for Rig....Apr. 166
Guard Pump Relief Valves....Apr. 168
Handle Casing with Dolly....Apr. 168
Fabricate Rack for Storing Tong Jaws....Apr. 170
Build Support for Spool of Wire Rope....Apr. 170
Arrange Sampling System....Apr. 172
Install Pump Safety Shield....Apr. 172
Make Portable Mud Tank....Apr. 176
Build Rack for Chain Tongs....Apr. 176
Adjust Discharge Lines....Apr. 178
Fix Backup Post to Drilling Rig Floor....Apr. 178
Protect Guy Line Cable....Apr. 180
Build Sectionalized Platform for Tank....May 137
Improve Method of Slugging Barytes....May 137
Facilitate Lowering Drill Pipe on Rack....May 137
Strengthen Suction Hose....May 140
Support End of Jacknife Mast....May 142
Build Cantilevered Walk Around Pump....May 142
Move Blowout Preventers....May 144
Regulate Gas Fuel Flow....May 144
Handle Cumbersome Pipe....May 147
Operate Water Well Jet....May 147
Minimize Mud Splatter....May 148
Support Overhead Lights....May 150
Add Walk to Truck Ramp....May 150
Attach Ladder for Inspection of Radiator....May 154
Add Hinged, Steel Walk to Mud Tank....June 148
Handle Mud Guns at Covered Tank....June 148
Remove Cuttings from Shale Shaker....June 148
Mount Mud Equipment....June 150
Protect Crew from Burns....June 150
Maintain Ready Access to Subs....June 154
Reduce Piping on Blowdown Systems....June 154
Keep Catline Free of Damaging Kinks....June 154
Construct Light Walkway....June 157
Guide Sand Line to Reel....June 157
Observe Gear Lubrication....June 158
Handle Cehmicals in Mixing Operation....June 160
Repair Boiler Water Treating Compounds....June 162
Store Boiler Water Treating Compounds....June 162
Assure Unobstructed View of Flow Lines....June 164
Center Bushing in Rotary Table Bowl....June 164
Increase Efficiency of Drilling Rig Boilers....July 1 141
Prevent Corrosion of Underfloor Engines....July 1 141
Elevate Flexible Mud Line....July 1 142
Install Shale Shaker Walk....July 1 143
Extend Rotary Chain Life....July 1 144
Position Kelly Over Light Rig Rathole....July 1 146
Manifold Water Lines from Boiler Gauges....July 1 146
Place Mud Gauge at Driller's Position....July 1 150
Construct Rack for Storing Pump Rods....July 1 150
Cool Brake Drawworks....July 1 152
Make Spool to Store Rope....July 1 152
Shelter Rig Control Panel....July 1 154
Add Suction Boom to Skid-Mounted Pump....July 1 156
Convert Jackknife A-Frame into a Shelter....Aug. 164
Attach Rig Lighting System to Mud Tank....Aug. 164
Improvise Transfer Ramp....Aug. 166
Lubricate Mud Pump Rods....Aug. 166
Install Dual Service Tank....Aug. 168
Build Walk Over Tanks....Aug. 170
Make Rigup Line Spool....Aug. 170
Insure Sufficient Light at Mud Pumps....Aug. 172
Build Permanent Mud Jet....Aug. 174
Rig Mud Pressure Gauge....Aug. 174
Increase Boiler Safety....Aug. 176
Erect Driller's Shelter....Aug. 176
Unitize Mud Pump Discharge Line System....Sept. 205
Add Water Slug to Drilling Fluid Suction....Sept. 205
Safeguard Relief Valves....Sept. 206
Take Cuttings at Shaker....Sept. 206
Rack Drilling Line Spool....Sept. 208
Add Skid Sill Adaptors....Sept. 208
Construct Sectional Folding Walkway....Sept. 210
Rig Preventer Controls....Sept. 212
Minimize Line Vibration....Sept. 212
Guide Hose on Jackknife....Sept. 214
Build Extinguisher Rack....Sept. 214
Fabricate Container for Rag Disposal....Sept. 218
Brace Weight Indicator....Sept. 220
Cool and Conserve Drawworks Brake Water....Oct. 152
Control Wild Tong Lines....Oct. 152
Transport Steam Cleaner....Oct. 154
Mount Vise on Rig Floor....Oct. 154
Construct Pressurized Lube Oil Dispenser....Oct. 156
Maintain Reserve Mud....Oct. 158
Protect Crew from Fluid Leak Injuries....Oct. 160
Install Mud Gauge Near Walk to Pump....Oct. 160
Install Mud Tank Bridge....Oct. 162
Build Chute for Tools....Oct. 162
Rack Shovels and Rakes....Oct. 164
Add Auxiliary Supports....Oct. 164
Reduce Mud Maintenance....Oct. 166
Carry Fire Extinguisher....Oct. 166
Build Lightweight Device to Drill Ratholes....Nov. 154
Switch to Reserve Mud Tank in Emergency....Nov. 154
Maintain Sufficient Fuel....Nov. 158
Anchor Derrick Standpipe....Nov. 158
Manifold Pump Suction....Nov. 160
Safeguard Visitors from Injury on Rig....Nov. 162
Protect Kelly from Damage in Rathole....Nov. 162
Streamline Pipe Hookup....Nov. 164
Use Highline Post to Transfer Tools....Nov. 166
Place Relief Valve to Protect Mud Pump....Nov. 166
Circulate Treated Water....Nov. 168
Unitize Cooling Water Circulation System....Dec. 156
Guide Tool Joints from Derrick to Rack....Dec. 156
Salvage Heavy Additives....Dec. 158
Drive Lubricating Pump....Dec. 158
Avoid Drilling Fluid Loss....Dec. 160
Circulate Rod Lubricant....Dec. 160
Reduce Surge in Mud Line....Dec. 162
Transfer Heavy Equipment....Dec. 162
Support Engine Mufflers....Dec. 164
Keep Line Tight on Spool....Dec. 166

PRODUCTION

Acidizing

Hydrafrac and Acidizing for Processing Limestones....Mar. 144
C. E. Clason

Acidizing Practices in Canyon Reef Section, Scurry County..Mar. 100
G. D. Simon

Value of Agents to Control Silicate Swelling in Acidizing....July 1 159
Dr. Paul H. Cardwell

Development in the Chemical Treatment of Wells in the Permian Basin....Sept. 236
R. S. Ousterhout

Casinghead Gas

Automatic Units Prepare Gas for Pipe Lines....Apr. 190

Chokes

Changing Positive Chokes on High-Pressure Wells....Jan. 152
Harry S. Baird

Church Butte Field

Drilling and Completion Practices in the Church Butte Field....July 1 178
W. C. Dinger

Condensate Recovery
Calculation of Natural Condensate Recovery.....June 178
T. W. Brinkley—R. C. Curtis

Corrosion
Corrosion Control in Water Flooding.....Jan. 141
Frederick Latter
Protection of Well Casing Against External Corrosion..Feb. 1 154
R. E. Hammond—S. P. Ewing
Inhibitor Control for Sulfide Corrosion.....Apr. 191
J. A. Caldwell
Corrosion Mitigation in the North McCallum Field
Part I .....Mar. 138
Part II.—Conclusion .....Apr. 214
C. C. Frye—W. L. Giezentanner—F. M. Clement
Corrosion Fundamentals in Field Application.....July 1 194
Dr. Alfred Chatenever
Corrosion and Scale Control.....Aug. 204
Edward N. Jones
External Corrosion of Gas and Oil Well Casings.....Sept. 262
C. I. Sims
Prediction of Corrosion in Oil and Gas Wells.....Oct. 180
D. A. Shock—J. D. Sudbury

Depth
Production Depth Record Shattered in Seven Areas....Feb. 15 168

Displacement Calculations
Oil Displacement Calculations.....Jan. 146
J. W. LaRue—D. A. Wilson

Dollarhide Field
Efficient Techniques Used in Dollarhide Completions....Sept. 246
Gilbert M. Wilson

Dynamometer
Elements of Dynamometer Tests.....Feb. 1 160
David S. Stear

Emulsions
Removal of Water and Emulsion Blocks to Stimulate Oil Production.
Part I .....Oct. 195
Part II (Conclusion) .....Nov. 191
Wayne F. Hower

Field Operating Problems
Keystone Field Operating Problems.....Sept. 226
Walter D. Powers

Flow Calculations
Open Flow Potential Calculation for Dual Completion Wells .....Feb. 1 150
C. W. Binckley—W. L. Hixon

Fracture Spacing
Fracture Spacing in Recovery of Repressured Oil.....Mar. 159
F. R. Cozzens

Gas Condensate
Pure Oil's Rollover Field—First Offshore Gas Condensate Production.....Oct. 169
George R. Olsen

Gas Lift
Gas Lift Practices in West Texas.....Sept. 250
J. R. Hamilton

Gas Well Testing
Testing Gas Wells by Back Pressure Method.....June 198
G. W. Hereford

Gravel Packing
The Full-Hole Gravel Pack—A New Completion Technique .....Aug. 185
R. L. O'Shields—M. F. Hawkins

High-Pressure Wells
Changing Positive Chokes on High Pressure Wells.....Jan. 152
Harry S. Baird

Hydrafrac Process
Applications and Results of the Hydrafrac Process....Feb. 1 133
W. E. Hassebrook
Hydrafrac and Acidizing for Processing Limestone.....Mar. 144
C. E. Clason

Leak Detector
Gas Well Casing Leak Detector.....Dec. 176
Joseph C. Richardson, Jr.

Liquefied Petroleum Gas
1950 L P G Sales Up 25.4 Percent.....Feb. 15 182
K. W. Rugh—G. R. Benz

Methods
New Production Methods Help Industry Set Records....Feb. 15 163
H. E. Treichler, Jr.

Natural Gas
Natural Gas to Continue Record Expansion.....Feb. 15 148
Heat Losses from Buried Gas Gathering Lines.....Nov. 171
J. T. Simon
Test Procedures for Natural Gas Wells, Relative Merits for .....Oct. 176
C. H. Hinton

Natural Gasoline
Natural Gasoline Increase Largest on Record.....Feb. 15 154

Offshore
Well Head Loading—Waves Forces and Vertical Loading on Offshore Well Casing.....Jan. 137
J. A. Reed, II—H. H. Meredith, Jr.
Practical Offshore Production Practices at Bay Marchand..June 167
J. E. Kastrop
First Offshore Gas Condensate Production—Pure Oil's Rollover Field.....Oct. 169
George R. Olsen

Paraffin
Paraffin Removal—Heater for Lead Line Paraffin Removal .....Jan. 140

Permeability
Permeability Constancy Range of a Porous Medium.....May 188
R. F. Nielsen
Relative Permeability—Measurement and Use of Relative Permeability Data .....July 1 184
Uzzell S. Branson, Jr.

Permian Basin
Development in the Chemical Treatment of Wells in the Permian Basin.....Sept. 236
R. S. Ousterhout

Plastics
New Techniques for Application of Plastics in Consolidating Formations .....Dec. 177
H. B. Ritch—P. H. Cardwell

Pressure Maintenance
Pressure Maintenance in Block 31 Field.....Sept. 223
Russell C. Hartman
Willamar West Field Plant Dedicated.....Oct. 202
Advanced Design Incorporated in New Willamar Pressure Maintenance Plant.....Nov. 174
R. F. Parker

Pump
Trailer-Mounted Pump Has Varied Oil Field Uses.....June 196

Pumping
Practical Application of Rod, Pump Production, Load Tables .....Apr. 194
D. M. Jones
Push-Button, Time-Clock Setup Pumps Gravity Flow Field .....Apr. 202
Estimating and Measuring Pumping Unit Peak Torque Loads .....Apr. 185
Kenneth N. Mills
24,944 Oil Wells to Get Pumping Equipment.....Feb. 15 137
Well Calculations—Simplified Pumping Well Calculations..May 162
A. A. Hardy
Lubrication and Pumping Unit Speed Reducer Life.....Nov. 198
Kenneth N. Mills
Heating Power Oil in Hydraulic Pumping.....Dec. 200

Refinery Operations
To Continue at Record Levels.....Feb. 15 178

Reserves
Petroleum Reserves Pass 30 Billion Mark.....Feb. 15 158

Reservoir Engineering
Thief Strata Analyses Reveal Energy Losses.....Jan. 162
F. R. Cozzens
A Review of Reservoir Engineering.
Part I .....May 157
Part II. Conclusion .....June 184
Norman J. Clark
Variation of Oil Characteristics with Elevation in Oil Reservoirs .....Dec. 192
Cecil Q. Cupps—P. H. Lipstate, Jr. and Joseph Fry

Sand Consolidation
New Techniques for Application of Plastics in Consolidating Formations .....Dec. 177
H. B. Ritch—P. H. Cardwell

Secondary Production
Surface Activity As Applied to Secondary Petroleum Production .....Nov. 184
Dr. Foster Dee Snell—Dr. Cornelia T. Snell

Sheaves
Procurement Problem and V-Belt Drive Design.....Oct. 205
J. H. Smartemo

Spraberry Sand
Completion Practices in the Spraberry.....Sept. 230
Harry E. Legendre
Spraberry A Silstone—Oil Men at Midland Debate.....Dec. 206

Statistics
Production Depth Records Shattered in Seven Areas...Feb. 15 168
Refinery Operations to Continue at Record Levels.....Feb. 15 178

Storage Racks
Servicing Mast Storage Racks.....May 161

Thermal Stresses
Thermal Stresses Around An Uncased Hole
Part II. Conclusion.....Jan. 155
K. D. Saunders—A. D. Topping

United States
New High in U. S. Crude Production Likely for 1951...Feb. 15 140

Water and Emulsion Blocks

Removal of Water and Emulsion Blocks to Stimulate Oil Production.
Part I. ..... Oct. 195
Part II, Conclusion ..... Nov. 191
Wayne F. Hower

Water Flooding

"Bradford" Practices in California Water-Flooding ..... Mar. 135
W. H. Somerton
Additional Oil Production Through Flooding With Carbonated Water ..... Aug. 179
J. W. Martin
Corrosion Control in Water Flooding ..... Jan. 141
Frederick Latter
Deep Zone Flooding in Arkansas ..... Aug. 192
Sterling S. Lacy, Jr.
Maintenance of Water-Flood Meters ..... Mar. 156
H. O. Proske
Water-Flood Problems As Experts See Them ..... Apr. 183
A. Gibbon
Water-Flood Programs—Supply, Sources and Treatment of Flood Water ..... Aug. 213
H. S. Barger
World's Largest Water-Flood Project to Save 140 Million Barrels of Oil ..... Oct. 60
A. Gibbon
Surface Activity As Applied to Secondary Production ..... Nov. 184
Water Injection in Primary Production Pays Off ..... Dec. 187
W. H. Davis

Well Data

Practical Application of Rod, Pump Production, Load Tables ..... Apr. 194
D. M. Jones

Well Logging

Electric Log Resistivity, Porosity and Water Saturation For Clean and Shaly Sandstones ..... Feb. 1 140
Park J. Jones
Electric Log Invasion of Filtrate Into Water, Oil and Gas Sandstone Beds ..... Apr. 204
Park J. Jones
Quantitative Log Interpretation of the San Andres Dolomite ..... July 1 166
C. B. Scotty

Wells

Producing Oil Wells Register Gain of 18,472 ..... Feb. 15 172

Well-Servicing

Factors in Well-Servicing Costs ..... Mar. 133
W. E. Best

Well Spacing

Well Interference Supports Wide Spacing ..... May 174
George R. Elliott

Wettability

Wettability in Oil Recovery ..... Mar. 145
P. T. Kinney—R. F. Nielsen

Winter Operations

Winter Operations in Western Canada ..... Dec. 169
G. D. Wright

Wyoming

Drilling and Completion Practices in The Church Buttes Field ..... July 1 178

PRODUCTION HINTS

HOW TO DO IT!

Remove Fine Sand from Flow Stream ..... Jan. 168
Construct Adaptable Stairway for Tanks ..... Jan. 168
Fabricate Efficient Plug Valve Wrench ..... Jan. 168
Connect Portable Checker ..... Jan. 171
Mount Bottles on Truck ..... Jan. 171
Use Discarded Chain to Brace Pull Pipes ..... Jan. 172
Speed Cooling of Circulating Water ..... Jan. 172
Improvise Simple Paraffin Scraper ..... Jan. 174
Anchor Pulling Unit Winch Dead Line ..... Jan. 176
Make Simple Gate Hinge Mounting ..... Jan. 176
Improvise Field Blow Case ..... Jan. 178
Prevent Freezing in Gas Flow Line Chokes ..... Feb. 1 165
Introduce Emulsion Chemical at Manifold ..... Feb. 1 165
Loosen Sucker Rods on Wet Pulling Jobs ..... Feb. 1 166
Add Corrosion Inhibitor ..... Feb. 1 168
Make Portable Boom for Pickup Truck ..... Feb. 1 170
Mount Liquid Meter Prover on Trailer ..... Feb. 1 171
Gather Test Samples at Flow Manifold ..... Feb. 1 172
Reinforce Pulling Unit Pulley Hold-Down ..... Feb. 15 193
Regulate Flow Rate Through Fluid Meter ..... Feb. 15 193
Anchor Pump Unit to Base ..... Feb. 15 194
Build Improved Drum Rack ..... Feb. 15 196
Arrange Rack for Temperature Testing ..... Feb. 15 196
Construct Stand for Fire Extinguishers ..... Feb. 15 198
Install Drip Pots at Meter Station ..... Feb. 15 200
Feed Chemical Into Power Oil System ..... Feb. 15 201
Mark Hydrant Locations ..... Feb. 15 202
Make Rack for Storing Tubing Pup Joints ..... Mar. 165
Add Corrosion Inhibitor to Gas-Lift Wells ..... Mar. 165
Store Pulling Unit Mast ..... Mar. 166
Save Storage Space on Well Pulling Truck ..... Mar. 168
Connect Gas Well for High Pressures ..... Mar. 170
Conserve Fluid When Bailing Flowing Well ..... Mar. 172
Build Simple Guard Rail for Pumping Unit ..... Apr. 222
Construct Sturdy Lubricator Gin Pole ..... Apr. 222
Prevent Freezing of Pump Unit Regulator ..... Apr. 223
Hold Down Elevated Steel Derrick Piers ..... Apr. 224
Mount Vessel for Feeding Inhibitor ..... Apr. 224
Adjust Intake Pipe of Sump Oil System ..... Apr. 226
Slug Chemical Down Casing ..... Apr. 228
Make Collapsible Rig Floor ..... Apr. 230
Eliminate Sag in Safety Fence Wire Lines ..... Apr. 232
Make Unitized, Transportable Meter Run ..... May 193
Convert Route Van Into Pumper's Truck ..... May 193
Transport Gas Cylinders ..... May 196
Safeguard Producing Wells Near Roads ..... May 198
Erect Folding Lease Gate ..... May 200
Prevent Hydrates in High Pressure Lines ..... May 204
Build Inexpensive Bases for Separators ..... May 206
Add Flush-Mounted Loading Dock Ladder ..... May 206
Increase Flexibility of Lease Utility Pump ..... June 206
Compensate Expansion on Injection Line ..... June 206
Power Boom Winch at Marine Installation ..... June 208
Warm Housing of Gas Line Orifice Meter ..... June 210
Scrub Field Gas for Compressor Engines ..... June 212
Equip Well Service Unit ..... June 214
Store Motor-Driven Tongs ..... June 216
Clean Out Flow Lines with Portable Heater ..... July 1 202
Construct An Improved Guard for Truck Bed ..... July 1 202
Take Sample at Separator ..... July 1 204
Guard Temperature Tube ..... July 1 204
Keep Gas Meter Charts Dry ..... July 1 206
Heat Air Inside of Gas Meter Housing ..... July 1 207
Adjust Skim Pit Discharge ..... July 1 208
Shut Off Oil Transfer Pump Automatically ..... Aug. 222
Prolong Life of Pumper's Tank Tables ..... Aug. 222
Bleed Gas Injection Line ..... Aug. 224
Construct Adequate Wellhead Enclosures ..... Aug. 225
Insure Clean Fuel Gas for Heater-Treater ..... Aug. 226
Modify Cattle Guard for More Efficiency ..... Aug. 227
Construct Permanent Mast ..... Aug. 228
Roll Lease Tanks with Gas from Separators ..... Sept. 266
Maintain Level of Water in Cooling Tower ..... Sept. 266
Construct Sturdy Tool Box for Truck ..... Sept. 267
Prevent Pulling Air in Gathering System ..... Sept. 268
Use High-Pressure Gas for Controls ..... Sept. 269
Cool Engine Radiator ..... Sept. 270
Install Safeguards on Water-Flood Pump ..... Sept. 271
Store Lubricating Oil at Pump Station ..... Sept. 272
Install Well Equipment Below Ground Level ..... Oct. 212
Convert Pumping Unit Base Into Tool Box ..... Oct. 212
Improve Bailer Dump Box ..... Oct. 214
Maintain Purity of Water for Injection ..... Oct. 216
Classify and Store Production Chokes ..... Oct. 218
Drain Pressure Regulator ..... Oct. 220
Reduce and Control High Gas-Oil Ratios ..... Nov. 206
Scrub Injection Water for Flood Project ..... Nov. 206
Pour Pump Unit Footing ..... Nov. 210
Maintain Sufficient Ice Water for Crew ..... Nov. 211
Rivet Single Hole in Tubing String ..... Nov. 212
Set Instrument in Flowing Well ..... Nov. 214
Connect Stop Cock Controller to Well ..... Nov. 216
Add Warning Signal to Cattle Guard ..... Nov. 218
Make Heavy-Duty, Self-Closing Latch ..... Nov. 218
Reduce Water Well Production Costs ..... Nov. 219
Provide Warm Water for Crew Washroom ..... Nov. 220
Maintain Convenient Supplies of Lubricants ..... Dec. 212
Collect Rainwater to Cool Engine Radiators ..... Dec. 212
Place Vacuum Gauge on Intake Manifold ..... Dec. 213
Proved for Flexibility of Gunbarrel Tank ..... Dec. 214
Add Conveniences to Pump Station ..... Dec. 215
Handle Compressor Engine Cooling Water ..... Dec. 216
Check Salt Water Flow from Gunbarrel Tank ..... Dec. 217
Add Crane to Framework ..... Dec. 218
Facilitate Laying Down Sucker Rods ..... Dec. 219
Store Water Hoses Around Field Camps ..... Dec. 220

PIPE LINE

Barge

Oil Barge for River Service ..... May 218

Booster Station

Individual Drive Cooling Units ..... Jan. 193
Design of Unattended Booster Station ..... Jan. 188
J. P. Hedlin

Bridge

Longest Aerial Pipe Line Span Is Structural Monument to Engineering Skill ..... Nov. 248

Cathodic Protection

A Bibliography on Cathodic Protection ..... Nov. 286
F. A. Rhormann

Coating

Developments in Internal Pipe-Coating ..... Jan. 181
J. K. Alfred
Inspection of Pipe Coating ..... Mar. 178
Marshall E. Parker

Cooling Tower

Cooling Tower Spray Water Cools Lube Oil ..... May 215
R. D. Ricketts
Cooling Water Design Adds Economy, Efficiency ..... June 232
R. D. Ricketts
Selection and Operation of Water-Cooling Towers and Air-Cooled Heat Exchangers ..... Dec. 228
Howard E. Degler

Combustion Indicators

Sampling and Analyzing Units Check Combustible Concentrations ..... Apr. 248

Common Carrier

Functions of Common Carrier Pipe Lines ..... May 64
A. Gibbon

Communication

Communication Survey—"Sighting Method" Cuts Survey Time ..... Feb. 1 175
E. Eugene Howe

Cost and Operating Characteristics of Microwave Systems.. June 223
E. B. Dunn

Compressor Station

Steam-Powered Compressor Station ..... Aug. 231
Donald M. Taylor

Application of Hydraulic Drive to Compressor Stations.. Nov. 275
Craig Lazzari

Construction

2000 Miles of TGT Lines in Final Stages of Completion.. Nov. 252

Careful Planning Precedes Speedy Construction of Trunkline System ..... Nov. 234

Pipe Line Construction—By Month: Jan. 197; Feb. 1-191; Mar. 191; Apr. 253; May 225; June 240; July 1-230; Aug. 247; Sept. 294; Oct. 239 Nov. 290; Dec. 239

Crude Oil

Crude Oil Pipe Line Activity in 1950 ..... Feb. 15 210

Diesel Stations

Diesel Stations Lift Oil Over Ridge Route ..... May 209
James Joseph

Ditching Machine

Truck Mounted Ditching Machine ..... Nov. 282

Elevated Lines

Scaffold Aids in Maintaining Elevated Pipe Lines ..... Oct. 236

Engines

Automatic Shutdown and Vent Controls for Gas Engines.. June 228
R. H. Dale

Practical Preventive Maintenance for Diesel and Gas-Diesel Engines ..... Oct. 223
J. H. Caldwell

Explosives

Explosives Ditch-Lake River Crossing Trench ..... Apr. 238
Philip R. Hammond

Flow

Pipe Line Flow Efficiencies ..... Sept. 282
Clinton McClure

Gasoline Plant

Gas Gathering Facilities of the Snyder Gasoline Plant.... Sept. 275
Harold G. Teverbaugh

Instrumentation

Instrumentation in Long Line Gas Transmission Systems.. Nov. 264
E. S. Plank

Laboratory

Shell Laboratory Proves Its Worth ..... June 219

Looping

Economic Factors Involved in Looping vs. Boosters ..... Nov. 245
N. B. Mavris

Machine Shop

Magnolia's Corsicana Machine Shop Saves Critical Materials ..... Sept. 290
Hunt Guitar

Map

Trunkline Gas Company System Map ..... Nov. 236

Mileage

17,000 Miles of New U. S. Pipe Lines Expected During 1951 ..... Feb. 15 205

Natural Gas

Natural Gas Pipe Line Activity in 1950 ..... Feb. 15 212

Mathematical Analysis of Texas Natural Gas Tax Reimbursement ..... Apr. 235
J. F. Summers

Offshore

Only Four Months Required to Lay Biggest Offshore Line.. Nov. 223
Donald M. Taylor

Work at Sea ..... Nov. 228

Pipe Yard

Pipe Yard ..... Nov. 225

Piston Ring

Latest Developments in Piston Ring Design ..... Aug. 234
H. F. Braendel

Pump

Centrifugal Pump Increases Crude Throughput ..... Dec. 238
Tom L. Turner

Reclaiming

38-Year Old Pipe Reclaimed ..... July 1 220
James Joseph

New Technique Speeds Pipe Reclamation ..... Nov. 242
T. W. Belt

Refrigeration

Hydrocarbon Dewpoint Control by Gas Refrigeration ..... Mar. 175
J. T. Simon

River Crossing

River Crossing Span Lifted As Single Unit ..... Feb. 1 180
Gilbert M. Wilson

Barytes in Continuous Weighting of River-Crossing Pipe.. Apr. 245

Explosives in Ditch-Lake River Crossing Trench ..... Apr. 238
Philip R. Hammond

Safety

Safety Rules for Pipe-Liners ..... Aug. 239
B. G. Pierce

Sampling

Sampling and Analyzing Units Check Combustible Concentrations ..... Apr. 248

Seal

New Seal Speeds Road Crossing ..... Nov. 262

Station

Sampling and Analyzing Units Check Combustible Concentrations ..... Apr. 248

Station Automatically Heats and Ships Crude Telemeters Data ..... July 1 213
Gilbert M. Wilson

Diesel Stations Lift Oil Over Ridge Route ..... May 209
James Joseph

Storage

Underground Storage of a Propane-Air and Natural Gas Mixture ..... Feb. 1 183
H. L. Fruechtenicht—John B. Simpson

Tank

Collapsible Storage Tank ..... June 236

Push Button Tank Gauging ..... May 214

Temperature Data

Heat Losses from Buried Gas Gathering Lines ..... Nov. 171
J. T. Simon

Valve

Engine Valve Failures and Remedies ..... July 1 224
A. L. Pomeroy

Selection of Control Valves for Large Capacity Liquid Pipe Line ..... Oct. 230
R. H. Putman

Mechanical Rotators Prolong Valve Life ..... Nov. 258
A. L. Pomeroy

Ventilation

Ventilation System Lessens H_2S Vapor Hazard ..... May 219
Holley P. Bradley

Welding

Submerged Arc Unit Welds Pipe Line on Right-of-Way.. July 1 211
C. A. Renton

PIPE LINE HINTS

HOW TO DO IT!

Tap Trunkline for Temporary Gas Supply ..... Jan. 200
Connect Blowcases for Station Utilities ..... Jan. 200
Cover Opening Over Flywheel Housing ..... Jan. 201
Arrange Piping Layout ..... Jan. 202
Fabricate Pipe Clamps ..... Jan. 202
Conserve Mercury in Filling Gauges ..... Jan. 203
Service Booster Pumps ..... Jan. 204
Insure Adequate Supply of Starting Air ..... Feb. 1 194
Protect Air Cleaners Against Backfires ..... Feb. 1 194
Make Simple Device for U-Bolt Bending ..... Feb. 1 196
Facilitate Repair of Storage Tanks ..... Feb. 1 197
Mount Acetylene Bottles ..... Feb. 1 198
Add Cover to Compressor ..... Feb. 1 198
Remove Exhaust Valves from Compressors ..... Feb. 15 224
Set Up Convenient Lubricating Drum Rack ..... Feb. 15 224
Convert Light Truck for Use of Gauger ..... Feb. 15 226
Reinforce Cast Iron Elbow ..... Feb. 15 228
Minimize Cracks in Monolithic Concrete ..... Mar. 194
Add Detachable Extension to Cattleguard ..... Mar. 194
Protect Equipment During Construction ..... Mar. 196
Provide Welder with Portable Windbreak ..... Mar. 196
Utilize Vent Pipe for Crossing Fence ..... Mar. 197
Erect Bridge for Engines ..... Mar. 198
Construct Chutes for Handling Concrete ..... Apr. 256
Build Supporting Bracket for Steam Trap ..... Apr. 256
Facilitate Repairs of Valves and Seats ..... Apr. 257
Erect Removable Housing for Meter ..... Apr. 258
Improve Mounting of Acetylene Bottles ..... Apr. 259
Make Portable Paint Pot ..... Apr. 260
Provide Efficient Water Valve Insulation ..... May 227
Improve Method of Blasting Ditch in Rock ..... May 227
Store Water Economically ..... May 228
Construct Jig for Flange ..... May 228
Rig Convenient Truck Loading Facilities ..... May 230
Fabricate Demountable Side Boom for Truck ..... May 230
Install Extra Scrubber in Hazardous Area ..... May 232
Facilitate Operation of Compressor Valves ..... June 244
Improve Ringer Circuit for Carrier Phone ..... June 244
Position Welding Leads Over Joints ..... June 245
Assure Stability of Side-Boom Tractor ..... June 245
Protect Pipe During Haul ..... June 248
Build Pipe Supports for Gathering Lines ..... June 249
Drain Swampy Site for Compressor Station ..... June 250
Make Ground Wire Clamp for Welding ..... June 250
Compensate Pipe Expansion ..... July 1 232
Make Simple Safety Skids ..... July 1 232
Provide Valve Drainage ..... July 1 234
Support Heavy Assemblies ..... July 1 234

Install Whistle on Air Bleedoff Valve....July 1 236
Establish Permanent Station Base Line....July 1 236
House Thermometers in Louvered Shelter....July 1 236
Weight Steel Sump Tank....Aug. 249
Control Spoil Bank Size....Aug. 249
Adjust Jig to Speed Small Pipe Welding....Aug. 249
Keep Track of Valves....Aug. 250
Make Pipe Threading Jig....Aug. 250
Provide Temporary Conduit for Cable....Aug. 252
Shield Floor During Construction Period....Aug. 252
Safeguard Bottles of Carbon Dioxide....Aug. 253
Install Valve Settings....Aug. 254
Screen Inspection Plate....Sept. 296
Cool Small Pumping Unit....Sept. 296
Mount Water Can Beneath Truck Bed....Sept. 296
Install Improved Welding Rod Storage Box....Sept. 298
Build Rack to Store Shovels at Job Site....Sept. 298
Drain Station Buildings....Sept. 300
Fabricate 45-Degree Jig....Sept. 302
Arrange Meter Support....Sept. 304
Safeguard Employees from Chemical Burns....Sept. 304
Lay Pipe in Sour Soil....Sept. 306
Dispose of Oil Vapors from Crankcase....Oct. 241
Tap Pipe Line for Station Fuel Supply....Oct. 241
Fabricate Efficient Reel for Fire Hose....Oct. 242
Insure Bond Between Primer and Coating....Oct. 242
Build Inexpensive Valve Platforms....Oct. 244
Regulate Fuel Gas for Engine Startup....Oct. 244
Make Improved Sling for Handling Drums....Oct. 245
Compress Valve Springs....Oct. 246
Rig Pump Time Shutoff....Nov. 294
Brace Extension Handle....Nov. 294
Add Tanks, Boxes to Mechanic's Pickup....Nov. 294
Make "C" Clamp in Shop....Nov. 296
Speed Closing of Valves....Nov. 296
Make Head Puller for L-Head Engines....Nov. 298
Signal Shutdown at Unattended Station....Nov. 298
Minimize Noise at Compressor Station....Nov. 300
Polish Floors with Air-Driven Machine....Nov. 302
Provide Support for Pump Guide Bracket....Nov. 302
Mark Insulating Flanges....Nov. 304
Estimate Heat Recovery....Dec. 241
Guard Water Line Against Surging....Dec. 241
Make Boom for Truck....Dec. 242
House Fire Extinguisher....Dec. 242
Control Corrosion in Salt Marsh Area....Dec. 244
Facilitate Setting Pumps and Engines....Dec. 244
Strengthen Valve on High Pressure Line....Dec. 246

INTERNATIONAL NEWS AND FEATURES

Africa

Nigeria, West Africa, Has First Deep Test for Oil....Dec. 300
Other Africa....July 15 228

Alaska

Alaska....July 15 149
Alaska Oil Field Confirmed....Dec. 302

Albania

Albania....July 15 222
Albania Pay Found....Oct. 260

Algeria and Morocco

Map....July 15 137
Algeria....July 15 224

Argentina

Petroleum Products Prices Advanced in Argentina....May 248
Argentina....July 15 171
Maps:
Mendoza and Neuquen (Plaza Huincul) Fields and Concession....July 15 122
Comodoro Rivadavia Fields and Concessions....July 15 123

Australia

Shell to Build Australia's Largest Distillation Plant....July 1 260
Australia....July 15 254
Australia PIB Is Set Up....Oct. 268

Austria

Report from Austria: Soviets Will Strip Fields Before Treaty Is Signed....June 268
Map—Austria and Czechoslovakia—Vienna Basin Fields....July 15 132
Austria....July 15 198
Austria's New Field Called Major Petroleum Discovery....Nov. 336
Soviets Exploring In Austrian Area....Dec. 308

Bahrein

Map....July 15 142
Bahrein—Saudi Arabia....July 15 236

Baja California

Pemex Contracts for Deep Test in Lower California....Apr. 280

Balkan Countries

Russians Try to Increase Balkan's Oil Production....Apr. 288

Belgium

Antwerp Refinery on Stream....Dec. 308

Bolivia

Bolivia....July 15 175

Borneo, British and Indonesia

Borneo Production Mounts, Far East Gets Emphasis....June 256
Borneo, British and Indonesia....July 15 244
Shell's British Borneo Test Under Way, Another Planned....Oct. 268

Brazil

Reserves in Three Brazilian Fields Set at 18 Million....Apr. 284
Brazil....July 15 178

British Columbia

British Columbia Receives Gas Through Alberta Line....Jan. 210
First Major Oil Discovery Made in British Columbia....Dec. 258
Vancouver Island—Possible Oil Bearing Area on Vancouver Island is Hinted....Dec. 306

Burma

Burma....July 15 240
BOC Blends Fuel in Burma....Oct. 268
New Tests Scheduled for Central Burma Oil Fields....Dec. 300
Burma Premier Promises Orderly Nationalization....Dec. 304

Canada

Petroleum Industry Developments—Importance of Recent Canadian Oil Developments....Jan. 207
John F. Fairlie
New Technique Taps Athabaska Tar Sands....Feb. 1 205
Dr. K. A. Clark
Reservoir Engineering—
Part II—Leduc D-2 Zone Pool....Feb. 1 210
Part III—Leduc D-3 Zone Pool....Mar. 210
James E. Baugh
Shot Hole Drilling in Canada....Feb. 1 217
W. A. Burggren
Helicopter Surveys Northern Canada....Apr. 264
Alberta Flying Magnetometer Survey Completed....May 235
Thomas M. O'Malley
Crude from Alberta Fields Completes 1800 Mile Trip....June 258
Oil Strengthens Prairie Economy....June 253
Bruce Mac Kinnon
Alberta Supplying Nearly Half of Canada's Needs....July 1 262
Drilling and Production Stepped Up in Canada....July 1 262
New Oil Regulations for Saskatchewan Adopted....July 1 262
Natural Gas Ruling May Slow Canadian Activity....July 1 252
Canada....July 15 149
Canada—Maps
Southern Alberta Fields....July 15 117
Central Alberta Fields....July 15 118
Norway Well Reference....Dec. 265
Oil in Western Canada....Dec. 250
Wizard Lake Field Area....Dec. 263
Bashaw Field Area....Dec. 270
Armena Field....Dec. 274
Caprona Field Area....Dec. 267
Devonian Reef Fields....Dec. 279
Devon, Alberta—Canada's Model Boom Town....Aug. 260
Pipe Line Proposed Would Link Eastern Canadian Cities....Sept. 328
Alberta Joint Venture Results in 675-Barrel Well....Sept. 334
First Show of Free Oil in Saskatchewan is Reported....Oct. 260
General Canadian Price Hikes on Gas, Oils Announced....Oct. 260
University of Alberta to Have It's Own "Well"....Oct. 266
Major Canadian Gas Field Indicated in Cessford Area....Nov. 312
Cretaceous Strike Steps Up Drilling Tempo in Canada....Nov. 324
Gulf's Canadian Wildcat Strikes Oil Near Stettler....Nov. 324
Canada's Subzero Temperatures Create Complex Operating Problems....Dec. 115
D. J. Elliott
Canadian Pipe Line Expansion....Dec. 223
Bob Shiels—C. W. Smith
Wizard Lake Field Is Four Zone Strike....Dec. 262
New Norway Field Is Recent Dual Pay Reef Discovery....Dec. 264
Caprona Field Has High Potential in D-2 Reef....Dec. 266
Bashaw Field Discovery Demonstrates High D-3 Reef Potentials....Dec. 268
Armena Field Is Promising New Viking Sand Discovery....Dec. 272
Canada's Reef Fairway Due for Big Year in '52....Dec. 278
L. F. Frantz
Redwater Review....Dec. 283
R. D. Knowles
Edmonton Canada....Dec. 289
Bob Shiels
Canadian Oil Search Pushes North....Dec. 295
Saskatchewan Has Record Activity....Dec. 302
Saskatchewan Test Fails to Find Commercial Field....Dec. 302
Alberta—Clive Potential Tests Scheduled for New Sector Producer....Dec. 306
1951 in Canada....Dec. 249
Gilbert M. Wilson

Central America

Central America....July 15 166

Ceram-Java-Netherlands New Guinea

Map....July 15 145

Chile

Map....July 15 124
Chile....July 15 180
Chile Production Tabulated....Dec. 306

China

China....July 15 242
Red China's Joint 'Operation' for Russia's Benefit Only....Nov. 334

Colombia

Colombia Plans to Encourage Increased Foreign Oil Participation....Jan. 220
Henry Ozanne
Colombia Believes 1950 Its Best Producing Year....Feb. 1 224
Colombia—Map....July 15 125
Colombia....July 15 185
International Accepts De Mares Proposal....Aug. 278
Empresa Takes Over De Mares Concession....Sept. 338

Cuba

Exploration Encouraged by Cuban Government....Jan. 210
Cuba....July 15 166

Czechoslovakia

Map—Vienna Basin Fields....July 15 132
Czechoslovakia....July 15 222

Denmark

Denmark....July 15 200

Ecuador

Eucador....July 15 186
Manabi Completes Initial Producer in Ecuador Area....Oct. 266

Egypt

Map....July 15 136
Egypt....July 15 224

Ethiopia

Ethiopia....July 15 226

Far East

Borneo Production Mounts....June 256

France

Map....July 15 133
France....July 15 200
Standard Affiliate Receives French Exploration Permit...Oct. 266

Germany

Germany's 1950 Oil Output Tops 7.8 Million Barrels....Mar. 224
Oil Discovery Reported in Celle Area of Germany....Apr. 284
Refinery—German Plant Adds Units....July 1 262
Map—Hanover Fields....July 15 134
Map—Border, Hamburg, Heide Fields....July 15 135
Germany....July 15 204
ECA Quota for Germany's Imports Set at $6,759,000....Aug. 276
Germany Has Gasser....Aug. 280
Western Germany's Crude Processing Rate Spirals....Oct. 268
West Germany Kills Report of Expert Aid to Iranians....Nov. 326
Second Wildcat Underway at Rhine Valley Location....Nov. 336
Emsland Field—New Pay Found....Dec. 308
Western Zone—Oil Consumption Totaled....Dec. 308
Wildcat Strikes New Pay, Hohne Field....Dec. 302
German Wildcat Below 4750....Dec. 302
Germany's Crude Output Passes 800,000 Barrels....Dec. 304

Great Britain

Work Begins on Britain's Largest Oil Tanker Dock; Completion Set for 1952....Mar. 218
Great Britain....July 15 210

Greece

Oil Sought in Greece....June 266

Hungary

Hungary....July 15 222
Hungarian Oil Saboteurs Cause Diversoin of Crude....Oct. 268

India

India....July 15 242

Indonesia

Indonesia and British Borneo....July 15 242
Indonesia's Oil at Full Flow....Aug. 267

Iran (See Persia)

Iraq

First Pipe Received for Kirkuk to Banias Line....Jan. 216
Map—Iraq....July 15 140
Iraq....July 15 232
Reported Agreement on Iraqi Squabble Denied by British..Aug. 278
Pipe Line to Banias....Nov. 307
Refinery, New, Will Be Built at Iraq, Premier Announces..Dec. 304

Italy

Italy....July 15 214
New Law Hastens Italian Nationalization....Aug. 280
Directionally-Drilled Well Cheats Blaze, Produces Oil...Sept. 309
Geo. E. Justice
Harmful Effects of Italian Monopoly Law Discounted....Sept. 334
Gas, Oil Structures Found in Italy's Bradano Valley....Oct. 264
Refining, Italians Fear Government Will Monopolize....Nov. 328
Ente Nazionale Idrocarburi, Government Oil Monopoly in Po Valley....Nov. 328

Japan

Japan—Map....July 15 143
Japan....July 15 246

Java-Ceram-Netherlands New Guinea

Map....July 15 144

Kuwait

Port—Mena Al Ahmadi—Kuwait Oil Company's Port....Jan. 212
Kuwait's 1950 Production May Show 37 Million Gain....Feb. 1 224
Map—Kuwait....July 15 141
Kuwait....July 15 234

Mexico

Tampico Embayment—Mexico's Fabulous Area of Oil Production....Jan. 214
Clark Millison
Mexico's Pipe Line Coast-To-Coast To Be Ready in May..Mar. 220
Gulf Agrees On Sale of Mexican Oil Properties....Mar. 224
Northeast Mexico—Vast Oil Frontier....Apr. 266
Tehuantepec Discovery Well Brightens Mexico's Outlook..June 274
Pemex To Drill Wildcat In Northeastern Mexico....June 266
American Independent Drills New Tabasco Discovery Well....July 1 264
Mexico....July 15 158
Mexico—Maps
Tampico Embayment....Jan. 215
Northeastern and Isthmus Fields....July 15 119
Panuco and Golden Lane Fields....July 15 120
Free Enterprise Oil Greases Wheels of Mexican Monopoly..Aug. 257
Mexico Isthmus Wildcat Being Drilled by CIMA....Oct. 262
Pemex Claims 64 Successful Completions in Six Months..Oct. 262
Poza Rica Is Aiming At 20,000 Barrel Hike....Oct. 264
Pemex Views Future With Optimism....Nov. 309
E. E. Barberii

Middle East

Aramco Makes Deal—Iran Talks Fail....Feb. 1 226
Middle East Output Gains Despite Political Unrest....May 248
Map....July 15 138

Morocco

Map....July 15 137
Morocco....July 15 226

Netherlands, The

The Netherlands....July 15 216
Map—Germany, The Netherlands....July 15 135
Netherlands Wildcat Drilling....Dec. 306

Netherlands New Guinea

Netherlands New Guinea....July 15 144

Neutral Zone

Neutral Zone....July 15 236

New Zealand

New Zealand....July 15 254

Pakistan

Pakistan Activity Quickens....Mar. 208
Pakistan....July 15 252
Pakistan Oil Output Drops but Progress Made In Development....Nov. 332

Paraguay

Paraguay....July 15 188

Persia (Iran)

Anglo-Iranian Completes Bridge Over Karun River....Mar. 224
Iran Nationalizes Oil....Apr. 263
Nationalization Certain—Britain Prepares New Bid In Iran....May 245
Robert E. Spann
Iranian Controversy Has Widening Repercussions....June 258
A Long Haul To Russia—Iran's Best Bet: Britain....June 257
Failure Of Iran Talks Perils Supply-Demand Balance..July 1 246
Map....July 15 139
Persia (Iran)....July 15 228
Firefighter's Diary....Aug. 264
Myron M. Kinley
Nationalization—Iran The Loser?....Sept. 330

Persian Gulf

Aramco Spuds First Offshore Test....Feb. 1 216
Henry Ozanne

Peru

Map....July 15 126
Peru....July 15 188

Philippines

Philippines Look To Increased Oil Activity....Feb. 1 220
Demetrio Andres
Philippines....July 15 252

Poland

Poland....July 15 222
Reds Set Polish Goals....Aug. 276
Polish Crude Output 13 Percent Shy of Goal During First Half....Nov. 330

Qatar

Map....July 15 142
Qatar....July 15 236

Roumania

Roumania....July 15 222
Roumanian Oil Production Rising, Claim Communists....Nov. 312

Saudi Arabia

Aramco Contributes To Saudi Arabian Private Enterprise..Mar. 206
Aramco Report Reveals Steady Progress....July 1 258
Map—Saudi Arabia—Bahrein—Qatar....July 15 142
Saudi Arabia—Bahrein....July 15 236
Aramco Has Two Discoveries....Aug. 282
Arabian Field Found....Sept. 334

Scotland

Plant Finished in Scottish Oil Expansion Program....June 276
Pipeline—Depot—"From Grangemouth to the Sea"....Oct. 254

South America

Montevideo and The Hague Are Site of Oil Sessions....Mar. 224

Sumatra

Map—Southern Oil Area....July 15 147
Map—Northern and Central Oil Areas....July 15 146

Syria

Syria Project Abandoned After Long Quest for Oil.....June 276

Trinidad

Map .....July 15 121
Trinidad .....July 15 166

Tunisia

Tunisia .....July 15 228

Turkey

Turkey .....July 15 240

United States

United States .....July 15 164

U. S. S. R.

Russia and Satellites.....July 15 218
Report Sheds Light on Russian Output.....Aug. 274
Oil in Russia. Dr. Leonid Smirnov. Part I.....Oct. 256
Part II .....Nov. 313
Map—Oil in Russia. European U. S. R. R.....Oct. 257
Map—Oil in Russia. Emba Basin Fields.....Nov. 313
Map—Oil in Russia. Ural-Volga Fields.....Nov. 314
Map—Oil in Russia. Kama River Fields.....Nov. 316

Vancouver Island

Possible Oil-Bearing Area on Vancouver Island is Hinted.Dec. 306
Also—See British Columbia.

Venezuela

Venezuela's Production Up as Exports to U. S. Hiked....Apr. 286
Production Increases Made by Most Firms in Venezuela..May 258
Flying Magnetometer Survey Completed in Venezuela...June 258
Venezuelan Output Nearly 1,700,000 Barrels Daily.....June 258
Venezuelan Labor Contract Sends Cost to New High.....June 274
Oil Field Communications. F. Vinton Long.....July 1 254
Boom in Venezuela. Robert E. Spann.....July 1 239
Maps:
Central Fields .....July 15 127
Eastern Fields .....July 15 128
Eastern Fields .....July 15 129
Northwestern Fields .....July 15 130
Southwestern Fields .....July 15 131
Venezuela .....July 15 190
Production—"Way is Clear for Continued High Production in Venezuela." (Interview—Dr. Antonio Martin Araujo) .....Sept. 324
Creole Output Hits Peak of 668,184 Barrels Daily.....Oct. 262

World

World Crude Production Tops Record by 350 Million Barrels .....Feb. 15 236
Montevideo and The Hague are Sites of Oil Sessions....Mar. 234
Third World Petroleum Congress.....Mar. 224
Oil and World Problems, F. Julius Fohs.....May 249
World Crude Production.....July 15 52
World Refining .....July 15 82
World Crude Reserves Up 41 Percent in Five Years....Feb. 15 233
World Crude Reserves.....July 15 67
World Supply and Demand Continue Upsurge.....Feb. 15 231
Kingdoms of Oil:
No I. Kilgore, Texas—Joseph P. Ellis.....Feb. 1 201
No. II. Snyder, Texas—Mark Olson.....Mar. 201
No. III. Ranger, Texas—Ronald B. Pruet.....Apr. 272
No. IV. Seminole, Oklahoma—Lloyd N. Unsell.....May 238
No. V. El Dorado, Arkansas—A. Gibbon.....July 1 242
No. VI. Devon, Alberta, Canada's Model Boom Town. Bob Shiels .....Aug. 260
No. VII. Midland, Texas—James C. Watson.....Sept. 316
No. VIII. Mexia, Texas—Don Kliewer .....Oct. 249
No. IX. Edmonton, Canada—Bob Shiels .....Dec. 289
Men—Of World Oil Men .....Mar. 217
Of World Oil Men.....Apr. 282
Of World Oil Men.....May 244
Of World Oil Men.....June 260
Of World Oil Men.....July 1 248
Of World Oil Men.....Aug. 270
Of World Oil Men.....Sept. 340
Of World Oil Men.....Oct. 270
Of World Oil Men.....Nov. 323
Of World Oil Men.....Dec. 310
Maximum Restrictions Mean Minimum Oil, Says Suman..Mar. 222
Foreign Students Fewer in U. S. Petroleum Colleges....Apr. 279
Iranian Controversy Has Widening Repercussions.....June 258
Free Enterprise—History of Oil Achievement Shows There Is No Substitute for Free Enterprise. Joseph E. Pogue.June 261
Tankers—All Purpose Tankers Being Built Under Shell Program .....June 276
IPAA Committee to Study Hemisphere Oil Supply.....July 1 264
Socialism—Pogue Warns of Increasing Socialism in Oil Countries .....July 1 264
Oil in 1950 .....July 15 48
Supply and Demand.....July 15 50
World Completions and Footage.....July 15 72
World Producing Wells.....July 15 76
Principal Companies—Operating Outside U. S.....July 15 88
Conversion Factors .....July 15 92
Oil Development Slowed by Government Operation. Robert E. Spann.....July 15 96
Laws—Digest of World Oil Laws.....July 15 97
Employment—"So You Want a Foreign Job".....Sept. 312
More Tankers Being Built Than All Other Type Ships...Oct. 266
World Map—"Coarse Sand in Deep Water".....Jan. 62
Women—Recognition for—"Desk and Derrick Clubs"....Nov. 317

Yugoslavia

Yugoslavia .....July 15 224
Yugoslavian Production .....Oct. 260

AUTHORS' INDEX

A

ALBRIGHT, JOHN C.
Substructure Design Reduces Rigging Time.....Feb. 1 100
Cantilever Shelter Protects Rig Power Plant.....June 142
Unitizing a Mud Tank.....Oct. 121
ALCORN, C. W.
Shop-Made Preheater Cuts Fuel Cost, Aids Boiler Efficiency .....Aug. 125
ALFRED, J. K.
Developments in Internal Pipe-Coating.....Jan. 181
ANDERSON, H. H.
Conserve Manpower and Materials.....Dec. 62
ANDRES, DEMETRIO
Philippines Look to Increased Oil Activity.....Feb. 1 220

B

BACHMAN, WILLIAM S.
Fatigue Testing and Development of Drill Pipe to Tool Joint Connections.....Jan. 104
BAIRD, HARRY S.
Changing Positive Chokes on High-Pressure Wells...Jan. 152
BAKER, WARREN L.
Oil Outlook Good.....Jan. 28
Industry Faces Big Future Discovery Task.....June 55
World Oil Predicts: 44,965 New Wells This Year.....Aug. 65
BARB, DR. CLARK F.
Regional Study Reveals Colorado Oil Prospects.....Feb. 1 72
BARBERII, E. E.
Pemex Views Future with Optimism.....Nov. 309
BARGER, H. S.
Supply, Sources and Treatment of Flood Water.....Aug. 213
BARTLEY, J. H.
Pennsylvanian Reef and Non-Reef Development in West Texas.....Sept. 142
BAUGH, JAMES E.
Leduc D-2 Zone Pool.....Feb. 1 210
Leduc D-3 Zone Pool .....Mar. 210
BELL, DR. ALFRED H.
Oil Possibilities of Niagaran Reefs in Illinois.....Jan. 74
BEERS, DR. ROLAND F.
Better Geophysical Interpretations—Whose Responsibility? .....Apr. 80
BELT, T. W.
New Technique Speeds Pipe Reclamation.....Nov. 242
BENZ, G. R.
1950 L P G Sales Up 25.4 Percent.....Feb. 15 182
BERRY, O. H., JR.
Air Drilling the Spraberry Sand.....Sept. 169
Wilshire Conducts Second Spraberry Air Drilling Venture .....Dec. 126
BEST, W. E.
Factors in Well-Servicing Costs.....Mar. 133
BINCKLEY, C. W.
Open Flow Potential Calculation for Dual Completion Wells .....Feb. 1 150
BIRTELL, JAMES C.
Professional Engineers and Labor Unions.....Apr. 60
BOATMAN, JOHN A.
Rowan's Barge Rig 13.....Nov. 119
BRADLEY, HOLLEY P.
Ventilation System Lessens H_2S Vapor Hazard.....May 219
BRADSHAW, A. E.
Continued Growth of Oil Industry Depends on Unencumbered Economy .....Sept. 89
BRAENDEL, H. G.
Late Developments in Piston Ring Design.....Aug. 234
BRANSON, UZZELL S., JR.
Measurement and Use of Relative Permeability Data.July 1 184
BRIGANCE, F. W.
Hazards in Outdated Drilling Equipment Costs.....Mar. 98
BRINKLEY, T. W.
Calculation of Natural Condensate Recovery.....June 178
BROWN, RUSSELL B.
Interview—Hardships Mount as Steel Shortage Worsens .....Jan. 45
BURGGREN, W. A.
Shot Hole Drilling in Canada.....Feb. 1 217
BURT, FRED M.
Drilling Engines Cooled With Own Waste Heat.....Dec. 146

C

CALDWELL, J. A.
Inhibitor Control for Sulfide Corrosion.....Apr. 191
CALDWELL, J. H.
Practical Preventive Maintenance for Diesel and Gas-Diesel Engines .....Oct. 223
CAMP, JOHN M.
Wet Auger Drilling of Seismograph Shot Holes.....Nov. 138
CARDWELL, DR. PAUL H.
Value of Agents to Control Silicate Swelling in Acidizing .....July 1 159
New Techniques for Application of Plastics in Consolidating Formations .....Dec. 177
CARUTHERS, C. B.
Factors Involved in Forming Spacing Units.....Mar. 48
CATTELL, R. A.
Bureau of Mines Role in Secondary Recovery—Part I.Jan. 56
Part II (Conclusion).....Feb. 1 50
CHATENEVER, DR. ALFRED
Corrosion Fundamentals in Field Application.....July 1 194
CHILTON, ERNEST G.
Investigation of Torque Converter Drives on Mud Pumps .....Sept. 189
CLARK, DR. K. A.
New Technique Taps Athabaska Tar Sands.....Feb. 1 205
CLARK, NORMAN J.
A Review of Reservoir Engineering—Part I.....May 157
Part II (Conclusion) .....June 184
CLASON, C. E.
Hydrafrac and Acidizing for Processing Limestones..Mar. 144
CLAYTON, NEAL
Weathering and Other Surface Shooting Problems...Mar. 57
Western Anadarko Basin Geophysical Problems.....Dec. 86

CLEMENT, FRED M.
Corrosion Mitigation in the North McCallum Field.
Part I ..... Mar. 138
Part II ..... Apr. 214
COLVIN, W. B.
Unitized Flow Line Aids Rigging-Up and Handling of Drilling Fluid ..... June 119
Expenses Skyrocket—Revenue per Foot Falls in Contractor's Battle for Existence ..... Sept. 179
Automatic Recorder Improves Drilling Efficiency ..... Dec. 121
COZZENS, F. R.
Thief Strata Analyses Reveal Energy Losses ..... Jan. 162
Fracture Spacing in Recovery of Repressured Oil ..... Mar. 159
Strata Variants Create Reactions in Plugged Wells ..... Dec. 151
CRAKE, W. S.
New Drilling Equipment Offered Industry in 1950. Feb. 15 105
CRAM, IRA H.
Excuses to Drill ..... Apr. 73
CRAMER, A. C.
Stability of Mud in High-Temperature Holes Shown by Surface Tests ..... Aug. 149
CUPPS, CECIL Q.
Variation of Oil Characteristics with Elevation in Oil Reservoirs ..... Dec. 192
CURTIS, R. C.
Calculation of Natural Condensate Recovery ..... June 178

D

DALE, R. H.
Automatic Shutdown and Vent Controls for Gas Engines ..... June 228
DALY, JOHN W.
Velocity Information Needed for Seismic Interpretation ..... June 86
DAVIS, W. H.
Water Injection in Primary Production Pays Off ..... Dec. 187
DEGLER, HOWARD E.
Selection and Operation of Water-Cooling Towers and Air-Cooled Heat Exchangers ..... Dec. 228
DINGER, W. C.
Drilling and Completion Practices in the Church Buttes Field ..... July 1 178
DUDLEY, RAY L.
Again We Say: Public Relations Program Pays ..... Jan. 25
DUNN, E. B.
Cost and Operating Characteristics of Microwave Systems ..... June 223
DURAN, LUIS GUILLERMO
Trigonometrical and Graphical Solution of Problems in Structural Mapping ..... Nov. 94

E

EDWARDS, ROY E.
Unusual Causes of Steamp Pump Troubles ..... Feb. 1 89
ELLIOTT, GEORGE R.
Well Interference Supports Wide Spacing ..... May 174
ELLIOTT, J. D.
Canada's Subzero Temperatures Create Complex Operating Problems ..... Dec. 115
ELLIS, JOSEPH P.
"Kilgore, Texas" ..... Feb. 1 201
EWING, S. P.
Protection of Well Casings Against External Corrosion ..... Feb. 1 154

F

FAIRLIE, JOHN F.
Importance of Recent Canadian Oil Developments ..... Jan. 207
FARRELL, D. M.
Safety Program Can Promote Multiple Benefits ..... July 1 55
FELT, JAMES R.
Tax Problems in the Oil and Gas Industry ..... Jan. 48
FISHER, HARWARD L.
Deep Structures and Multi-Pay Fields Offer Significant Developments in West Texas ..... Sept. 138
FOHS, F. JULIUS
Oil and World Problems ..... May 249
FRANTZ, L. F.
Canada's Reef Fairway Due for Big Year in '52 ..... Dec. 278
FRUECHTENICHT, H. L.
Underground Storage of a Propane-Air and Natural Gas Mixture ..... Feb. 1 183
FRY, JOSEPH
Variation of Oil Characteristics With Elevation in Oil Reservoirs ..... Dec. 192
FRYE, C. S.
Corrosion Mitigation in the North McCallum Field
Part I ..... Mar. 138
Part II ..... Apr. 214

G

GIBBON, ANTHONY
Horizontal Centrifuge Desands Contaminated Mud ..... Mar. 99
Water-Flood Problems As Experts See Them ..... Apr. 183
Functions of Common Carrier Pipe Lines ..... May 64
El Dorado, Ark. ..... July 1 242
Elk City Operators Unite for Conservation ..... Oct. 55
World's Largest Water-Flood Project to Save 142 Million Barrels of Oil ..... Oct. 60
GIEZENTANNER, W. L.
Corrosion Mitigation in the North McCallum Field
Part I ..... Mar. 138
Part II ..... Apr. 214
GLOVER, R. C.
Cable Tool Coring ..... Apr. 147
GOINS, W. C. JR.
Down the Hole Pressure Surges and Their Effect On Loss of Circulation ..... June 107
GRAY, G. R.
Stability of Mud in High-Temperature Holes Shown by Surface Tests ..... Aug. 149
GRIM, RALPH E.
Clay Mineralogy and the Petroleum Industry ..... Mar. 61
GROSSMAN, WALDO L.
Primary Cementing of Casing in Rotary-Drilled Wells. Apr. 153
GUITAR, HUNT
Magnolia's Corsicana Machine Shop Saves Critical Materials ..... Sept. 290
GUYOD, HUBERT
The Shielded-Electrode Method ..... Dec. 134

H

HAMILTON, J. R.
Gas Lift Practices in West Texas ..... Sept. 250
HAMILTON, DR. R. G.
Log Analyzer Simplifies Electric Log Quantitative Calculations ..... Aug. 143
HAMMOND, PHILIP R.
Explosives Ditch Lake-River Crossing Trench ..... Apr. 238
HAMMOND, R. E.
Protection of Well Casings Against External Corrosion ..... Feb. 1 154
HARRIS, DR. SIDON
What New Reserves Can We Expect to Find in the Permian Basin? ..... Sept. 91
HARTMAN, RUSSELL C.
Pressure Maintenance in Block 31 Field ..... Sept. 223
HASSEBROEK, W. E.
Applications and Results of the Hydrafrac Process ..... Feb. 1 133
HAWKINS, M. F.
The Full-Hole Gravel Pack . . . A New Completion Technique ..... Aug. 185
HEAD, ALBERT L. JR.
A Drillability Classification of Geological Formations ..... Oct. 125
HEDLIN, J. P.
Design of Unattended Booster Station ..... Jan. 188
HEREFORD, G. W.
Testing Gas Wells by Back Pressure Method ..... June 198
HILLS, J. O.
A Review of Casing String Design, Principles, and Practice.
Part I ..... July 113
Part II (Conclusion) ..... Oct. 141
HINTON, C. H.
Relative Merits of Test Procedures for Natural Gas Wells ..... Oct. 176
HIXON, W. L.
Open Flow Potential Calculation for Dual Completion Wells ..... Feb. 1 150
HORNER, VICTOR V.
Appraisal of Drilling Mud Costs—Part I ..... Dec. 127
HOWE, E. EUGENE
Novel Sighting Method Cuts Survey Time ..... Feb. 1 175
HOWER, WAYNE F.
Removal of Water and Emulsion Blocks to Stimulate Oil Production.
Part I ..... Oct. 195
Part II (Conclusion) ..... Nov. 191
HOYLMAN, H. WAYNE
A Two-Level Aeromagnetic Profile Across Western Texas ..... Feb. 1 62
Evaluation of Magnetics in the Delaware Basin ..... Aug. 91
HUGHES, J. C.
Gravity Exploration for Reefs and Other Porosity Maxima ..... June 78
HUHN, FRED
New Technique for Tubular Goods Inspection ..... Oct. 120

I

IRVING, RALPH
Removing Mill Scale Increases Pipe Service Life ..... Oct. 140

J

JENNY, W. P.
Aerial Magnetic Oil Discoveries ..... Nov. 85
JEWETT, DR. JOHN MARK
Eastern Kansas Developments and Prospects ..... Aug. 100
JOHNSON, J. H.
Insurance Problems of the Drilling Contractor ..... Oct. 117
JONES, D. M.
Practical Application of Rod, Pump Production, Load Tables ..... Apr. 194
JONES, EDWARD N.
Corrosion and Scale Control ..... Aug. 204
JONES, L. DAN
Legislative Outlook Poses Problems for Oil Industry. Feb. 15 67
JONES, PARK J.
Electric Log Resistivity, Porosity and Water Saturation for Clean and Shaly Sandstones ..... Feb. 1 140
Electric Log Invasion of Filtrate Into Water, Oil and Gas Sandstone Beds ..... Apr. 204
Improved Proration Would Expand Reserves ..... July 1 68
JORDAN, ROSALIE
Recognition for Oil Women (Desk and Derrick Clubs). Nov. 317
JOSEPH, JAMES
Diesel Stations Lift Oil Over Ridge Route ..... May 209
38-Year-Old Pipe Reclaimed ..... July 1 220
JUSTICE, GEO. E.
Directionally-Drilled Well Cheats Blaze, Produces Oil. Sept. 309

K

KASTROP, J. E.
Rotary System of Drilling Pioneered at Spindletop ..... Jan. 233
Geophysical Costs Outrun Prices ..... May 55
Practical Offshore Production Practices at Bay Marchand ..... June 167
KELLEY, BEN F.
Coddle That Cathead! ..... Feb. 1 106
KINLEY, MYRON M.
Firefighter's Diary ..... Aug. 264
KINNEY, P. T.
Wettability in Oil Recovery ..... Mar. 145
KLAUS, H.
Gravity Exploration for Reefs and Other Porosity Maxima ..... June 78
KLIEWER, DON
Manpower Shortage Troubles Drilling Industry ..... Oct. 63
Kingdoms of Oil—No. 8 "Mexia, Texas" ..... Oct. 249
Oil from Coal **Not Needed** ..... Nov. 59

KNOWLES, R. D.
Redwater Review ..... Dec. 283
KRUEGER, R. F.
The Effect of Mud Filtrates and Mud Particles Upon the Permeabilities of Cores—Part I ..... July 1 125
KRUMBEIN, W. C.
Regional Stratigraphic Analysis as a Guide to Geophysical Exploration ..... Apr. 99

L

LACY, STERLING S., JR.
Deep Zone Flooding in Arkansas ..... Aug. 192
LAIRD, DR. WILSON M.
Discovery Heightens Interest in North Dakota Geology.
Part I ..... June 73
Part II ..... July 1 83
LANTZ, ROBERT J.
Stratigraphy of Key Arkansas Deep Test ..... Oct. 83
LA RUE, J. W.
Oil Displacement Calculations ..... Jan. 146
LATTER, FREDERICK
Corrosion Control in Water-Flooding ..... Jan. 141
LAZZARI, CRAIG
Application of Hydraulic Drive to Compressor Stations ..... Nov. 275
LEGENDRE, HARRY E.
Completion Practices in the Spraberry ..... Sept. 230
LIPSTATE, PHILLIP H.
Variation of Oil Characteristics With Elevation in Oil Reservoirs ..... Dec. 192
LITMAN, K. K.
Stability of Mud in High-Temperature Holes Shown by Surface Tests ..... Aug. 149
LOGAN, L. J.
Spindletop—First and Among Best of Gulf Coast Fields ..... Jan. 228
Reserves Lag Behind Rising Oil Use ..... Apr. 64
Oils in Strong Demand ..... May 61
Company Operations Reflect Competition ..... June 61
Continuing Strong Demand Requires Sustained Operations ..... Aug. 58
Fewer Flares Light Texas Skies ..... Feb. 1 39
The Changing Panorama 1950-51 ..... Feb. 15 39
Permian Basin Yields Fifth of U. S. Oil Production ..... Sept. 107
LONG, F. VINTON
Oil Field Communications in Venezuela ..... July 1 254
LOPER, R. G.
Thin Oil Column Completions ..... May 99
LUBINSKI, ARTHUR
Buckling of Rotary Drilling Strings.
Part I ..... Mar. 105
Part II ..... Apr. 137
Part III ..... May 122
Part IV (Conclusion) ..... June 124

M

MacDONALD, G. D.
Application of Drilling Cost Analysis ..... Apr. 160
MacKINNON, BRUCE
Oil Strengthens Prairie Economy ..... June 253
MacMILLAN, J. K.
Geophysical Operations in the Canadian Bush ..... Dec. 81
MAHER, JOHN C.
Pre-Pennsylvanian Rocks Along the Front Range of Colorado ..... Oct. 88
MARTIN, JAMES W.
Addional Oil Production Through Flooding With Carbonated Water ..... Aug. 179
MAVRIS, N. B.
Economic Factors Involved in Looping vs. Boosters ..... Nov. 245
McCLURE, CLINTON
Pipe Line Flow Efficiencies ..... Sept. 282
McNUTT, R. D.
Care and Maintenance of Wire Rope ..... Feb. 1 108
MERCIER, V. J.
Simultaneous Radiation Logging in Kansas ..... Nov. 146
MEREDITH, H. H., JR.
Wave Forces and Vertical Loading on Offshore Well Casing ..... Jan. 137
MILLS, KENNETH N.
Fluid Drives for Drilling Rigs ..... Jan. 87
Estimating and Measuring Pumping Unit Peak Torque Loads ..... Apr. 185
Lubrication and Pumping Unit Speed Reducer Life ..... Nov. 198
MILLISON, CLARK
Tampico Embayment—Mexico's Fabulous Area of Oil Production ..... Jan. 214
MURPHY, LOUIS, J.
Operating Guide for A.C. Drilling Rig Motors ..... Mar. 89
Getting Most From D.C. Drilling Motors ..... May 118

N

NEAL, E. P.
South Ceres—Oklahoma's Oddest Shoestring Field ..... Dec. 92
NEUMAN, DR. L. J.
New Developments in Geophysical Prospecting ..... Apr. 90
NIELSEN, R. F.
Wettability in Oil Recovery ..... Mar. 145
Permeability Constancy Range of a Porous Medium ..... May 188
NOWAK, T. J.
The Effect of Mud Filtrates and Mud Particles Upon the Permeabilities of Cores.
Part I ..... July 1 125
Part II (Conclusion) ..... Aug. 152

O

OLSEN, GEORGE R.
First Offshore Gas Condensate Production ..... Oct. 169
OLSON, MARK
World Crude Production Tops Record by 350 Million Barrels ..... Feb. 15 236
"Snyder, Texas" ..... Mar. 201
Northeast Mexico—Vast Oil Frontier ..... Apr. 266
O'MALLEY, THOMAS M.
Alberta Flying Magnetometer Survey Completed ..... May 235
O'SHIELDS, R. L.
The Full-Hole Gravel Pack—A New Completion Technique ..... Aug. 185
OUSTERHOUT, R. S.
Developments in the Chemical Treatment of Wells in the Permian Basin ..... Sept. 236
OZANNE, HENRY
Colombia Plans to Encourage Increased Foreign Oil Participation ..... Jan. 220
Aramco Spuds First Offshore Test ..... Feb. 1 216
Oil Joins Other Industries in Upholding Free Enterprise ..... Feb. 1 44

P

PARKER, MARSHALL E.
Inspection of Pipe Coating ..... Mar. 178
PARKER, R. F.
Advanced Design Incorporated in New Willamar Pressure Maintenance Plant ..... Nov. 174
PIERCE, B. G.
Safety Rules for Pipe-Liners ..... Aug. 239
PLANK, E. S.
Instrumentation in Long Line Gas Transmission Systems ..... Nov. 264
POGUE, JOSEPH E.
No Substitute for Free Enterprise ..... June 261
POMEROY, A. L.
Engine Valve Failures and Remedies ..... July 1 224
Mechanical Rotators Prolong Valve Life ..... Nov. 258
PORTER, FRANK M.
Industry Must Guard Against Government Encroachment (Interview) ..... Nov. 57
POWERS, WALTER D.
Keystone Field Operating Problems ..... Sept. 226
PROSKE, H. O.
Maintenance of Water-Flood Meters ..... Mar. 156
PRUET, RONALD B.
Ranger, Texas ..... Apr. 272
PUTMAN, R. H.
Selection of Large Control Valves for Large Capacity Liquid Pipe Lines ..... Oct. 230

Q

QUEENSBURY, WM., JR.
Willshire Conducts Second Spraberry Air Drilling Venture ..... Dec. 126

R

REED, J. A., II
Wave Forces and Vertical Loading on Offshore Well Casing ..... Jan. 137
REESE, AL
Better Bosses—The Humble Way ..... Mar. 44
Humble Takes the Highways to Safety ..... Apr. 55
Your Company Magazines ..... May 68
BENTON, C. A.
Submerged Arc Unit Welds Pipe Line On Right-of-Way ..... July 1 211
RICHARDSON, JOSEPH C.
Gas Well Casing Leak Detector ..... Dec. 176
RICKETTS, R.D.
Cooling Tower Spray Water Cools Lube Oil ..... May 215
Cooling Water Design Adds Economy, Efficiency ..... June 232
New Fishing Technique Developed for Wire Line Devices ..... July 1 132
Anti-Earthquake Operations ..... Feb. 1 83
RITCH, H. B.
New Techniques for Applications of Plastics in Consolidating Formations ..... Dec. 177
ROBERTS, D. L.
Anti-Earthquake Damage Operations ..... Feb. 1 83
ROHRMAN, F. A.
A Bibliography on Cathodic Protection ..... Nov. 286
RUST, DR. W. M., JR.
Exploration Geophysics . . . Yesterday, Today, Tomorrow ..... Apr. 76
RYAN, JOHN C.
See Fisher, Harward L. ..... Sept. 138

S

SAUNDERS, K. D.
Thermal Stresses Around An Uncased Hole—Part II. (Conclusion) ..... Jan. 155
SCHABARUM, BRUNO
Crooked Holes ..... Nov. 142
SCOTTY, C. B.
Quantitative Log Interpretation of the San Andres Dolomite ..... July 1 166
SENNING, R. C.
The Spraberry Play in West Texas ..... Sept. 125
SHAFFER, PAUL D.
Locating Physical Failures in Drill Pipe ..... Sept. 196
SHAW, A. W.
Unitized Mud Pumps Increase Flexibility ..... July 1 107
SHEPARD, FRANCIS P.
Sand and Gravel in Deep-Water Deposits ..... Jan. 61
SHIELS, BOB
Devon, Alberta—Canada's Model Boom Town ..... Aug. 260
Canadian Pipe Line Expansion ..... Dec. 223
Kingdoms of Oil "No. 9—Edmonton, Canada" ..... Dec. 289
SHOCK, D. A.
Prediction of Corrosion in Oil and Gas Wells ..... Oct. 180
SIMON, G. D.
Acidizing Practices in Canyon Reef Section, Scurry County ..... Mar. 100
SIMON, J. T.
Hydrocarbon Dewpoint Control by Gas Refrigeration ..... Mar. 175
Heat Losses from Buried Gas Gathering Lines ..... Nov. 171
SIMS, C. I.
External Corrosion of Gas and Oil Well Casings ..... Sept. 262

SKINNER, D. U.
The Evolution of Fishing Techniques ..... Nov. 132
SMIRNOV, DR. LEONID
Oil in Russia—Part I ..... Oct. 256
Part II ..... Nov. 313
SMITH, CECIL W.
Exploration Record Set in Drilling 8745 Tests ..... Feb. 15 73
Oils in Strong Demand ..... May 61
Permian Basin Maintains Position As Drilling Leader .. Sept. 106
Canadian Pipe Line Expansion ..... Dec. 223
SMITH, G. WENDELL
Williston Basin Oil Possibilities ..... July 1 78
SMITH, J. E.
Reverse Circulating of Drill-Stem Tests in Open Hole . Feb. 1 102
SMITH, NEAL J.
Accuracy Factors in Geophysical Prospecting—Part I .. Apr. 84
Part II ..... May 73
SNARTEMO, J. H.
Procurement Problems and V-Belt Drive Design ..... Oct. 205
SNELL, DR. FOSTER DEE & DR. CORNELIA T.
Surface Activity As Applied to Secondary Petroleum Production ..... Nov. 184
SOMERTON, W. H.
"Bradford Practices" in California Water-Flooding .... Mar. 135
SPANN, ROBERT E.
Exports and Imports to Be in Sharp Contrast ..... Feb. 15 55
Boom in Venezuela ..... July 1 239
Free Enterprise Oil Greases Wheels of Mexican Monopoly ..... Aug. 257
Britain Prepares New Bid in Iran ..... May 245
Steel Shortage to Restrict Industry Operations ..... Aug. 71
U. S. May Produce 8 Million Barrels Daily by 1955 ..... Sept. 111
Mounting Exports Increase Oil Demand in U. S. ..... Nov. 64
"Last Drop" of Oil Sighted ..... Dec. 61
STACKPOLE, J. L.
Materials Control Practices ..... July 1 61
STALEY, GLENN
Pre-Permian Pays Productive in New Mexico's New Fields ..... Sept. 146
STEAR, DAVID S.
Elements of Dynamometer Tests ..... Feb. 1 160
STERRETT, ELTON
Pontoon Ferry Eliminates Expensive Bridging Operation ..... Feb. 1 98
STUART, R. W.
Latest Applications of Diamond Coring ..... Sept. 173
SUDBURY, J. D.
Prediction of Corrosion in Oil and Gas Wells ..... Oct. 180
SUMMERS, J. F.
Mathematical Analysis of Texas Natural Gas Tax Reimbursement ..... Apr. 235

T

TATUM, J. L.
Significant Developments in the Four Corners Area .. July 1 73
TAYLOR, DONALD M.
Steam-Powered Compressor Station ..... Aug. 231
Only Four Months Required to Lay Biggest Offshore Line ..... Nov. 223
TEVERBAUGH, HAROLD G.
Gas Gathering Facilities of the Snyder Gasoline Plant .. Sept. 275
THOMAS, HORACE D.
Wyoming Possibilities Enhanced by Variety of Oil Traps ..... May 80
THOMPSON, A. W.
Current Problems of the Drilling Contractor ..... Mar. 83
THOMPSON, FRED D.
Texas Research Center Aids Oil Industry ..... July 1 69
TORELL, L. C.
Enlarging Rotary Drilling Rope Reduces Ton-Mile Costs ..... Apr. 151
TOOMEY, DAVID F.
Investigation of Torque Converter Drives on Mud Pumps ..... Sept. 189
TOPPING, A. D.
Thermal Stresses Around An Uncased Hole. Part II (Conclusion) ..... Jan. 155
Time-Dependent Strains Around Uncased Holes ..... July 1 134
TREICHLER, J. E., JR.
New Production Methods Help Industry Set Records . Feb. 15 163
TURNER, TOM L.
Centrifugal Pump Increased Crude Throughput ..... Dec. 238

U

UNSELL, LLOYD N.
"Seminole, Okla." ..... May 238

W

WACHTMAN, HENRY CHARLES, JR.
Effect of Mud Pump Surges ..... Jan. 94
WANAMAKER, J. A.
Rotary Percussion Drilling in West Texas ..... Sept. 182
WATSON, JAMES G.
"Midland, Texas—Kingdoms of Oil" No. VII ..... Sept. 316
WEAVER, PAUL
Avenues for Progress in Geology and Geophysics ..... Apr. 102
WEEKS, L. G.
Sedimentary Basins and Oil Occurrence ..... Mar. 71
WEICHERT, J. P.
Down the Hole Pressure Surges and Their Effect on Loss of Circulation ..... June 107
WHEELER, DR. ROBERT W.
Oil Is How You Find It. Part I ..... Oct. 93
Part II ..... Nov. 95
WILSON, D. A.
Oil Displacement Calculations ..... Jan. 146
WILSON, GILBERT M.
Adjustable Measuring Line Supports ..... Jan. 119
Portability and Compactness Feature Generator House and Mud Tank Units ..... Feb. 1 96
River Crossing Span Lifted As Single Unit ..... Feb. 1 180
Diesel Electric Rig Designed for Medium or Deep Drilling ..... May 111
Better Designed Pipe Rack Speeds Rigging-Up ..... June 139
Water Tank Makes Engine Foundation ..... July 1 124
Station Automatically Heats and Ships Crude Telemeters Data ..... July 1 213
Gas Replaces Drilling Mud in San Juan Basin Operations ..... Aug. 128
Efficient Technique Used in Dollarhide Completions ... Sept. 246
"1951 in Canada" ..... Dec. 249
WING, ROBERT C.—Cmdr. U. S. N.
Atomic Warfare and the Oil Industry ..... Oct. 64
WOODS, HENRY B.
Analysis of Rock Bit Performance Data ..... Sept. 193
WRIGHT, G. D.
Winter Operations in Western Canada ..... Dec. 169

Z

ZERR, CHARLES M.
Abuses of Wire Ropes ..... June 114

Current Issues fifty cents ($.50). Issues Over One Year Old, One Dollar ($1.00) per copy.
Special Issues, One Dollar ($1.00)

WORLD OIL is published monthly by Gulf Publishing Company
3301 Buffalo Drive (Post Office Box 2608, Houston 1, Texas)